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23 October 1987

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Attention: Mr. P. Hunt
Senior Environmental Planner

Site Assessment
Phase 4B: Transportation

Dear Sirs:

We are pleased to submit the enclosed final report, Site Assessment Phase 4B: Transportation.

The report has been prepared in two volumes. The first volume contains Chapters 1 through 7. The second contains the Technical Appendices A through G.

Yours truly,

M.M. DILLON LIMITED

John R. Crosby

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EXECUTIVE SUMMARY

SITE ASSESSMENT PHASE 4B: TRANSPORTATION

1. PURPOSE

The purpose of the Site Assessment Phase 4B: Transportation report is to assist the Ontario Waste Management Corporation (OWMC) in the preparation of information essential to the environmental assessment (page 1). This report is but one of a series of reports being prepared for the OWMC to assess the preferred site at the conclusion of Phase 4A: Site Selection Process (page 2).

This Phase 4B report follows from the report, M.M. Dillon Limited, October 1985, Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Transportation (page 2). During Phase 4A, detailed comparative evaluation undertaken for purposes of site selection, a considerable amount of information was collected to permit the consultants to evaluate and compare the risks, impacts, and costs associated with the candidate siting options (page 3). From the transportation perspective all input data to the risk, impact and cost analyses have been reviewed and supplemented to produce an improved level of precision from that obtained during the prior Phase 4A activities (page 3).

2. SCOPE AND METHODS

The five objectives of the site assessment program are as follows (page 9):

- Verify/update;
- Establish Baseline;
- Risk and Impact Assessment;
- Mitigation;
- Monitor.

The transportation information required to carry out the assessment of the preferred site was largely obtained through the govenment agencies associated with roads along the preferred access route, and field studies conducted by M.M. Dillon Limited (page 12). Input received through public meetings and workshops were also considered.

2.1 Transportation Factors and Data Collection

The factors examined in the transportation assessment fall into two categories: risks and impacts. The risk catagory deals with the possibility of a spill or accident involving truck or employee traffic generated by site construction and operations. Impacts include the changes in traffic conditions along the preferred access route due to the implementation of the waste treatment centre (page 13).

The Phase 4A factors were verified or modified based on updated data and more detailed analyses (page 13). The data collection process involved gathering information from road agencies and field surveys, as well as from reports prepared for previous stages, and information supplied by other consultants (page 14).

2.2 Verification of Phase 4A Analysis

The purpose of this component of the site assessment is to confirm the results of the transportation analysis applied in the Phase 4A Site Selection process as they relate to the Preferred Site (page 36). In achieving this objective, a series of statistical evaluations were carried out for the accident frequency data and changes in the traffic volume projections were examined (page 38).

2.3 Define Baseline Conditions

The purpose of defining the baseline transportation is to provide a basis for assessing the transportation risks and impacts associated with the proposed facility (page 43). There were four areas where baseline conditions were determined: road geometrics, traffic volumes, accident history, and intersection capacity (page 44). In this study, the baseline conditions were assessed for the year 1986 and each of the three time horizons: 1990, 1995 and 2000 (page 43).

The transportation information applied to document the existing conditions was based on data obtained from the road operating agencies and information collected during field observations by M.M. Dillon Limited (page 44).

2.4 Risk and Impact Assessment

Risk and impact assessment deal with the risks and impacts associated with the use of the preferred access route from the QEW to the site entrance by the truck traffic generated by the waste treatment facility (page 11). The transportation risk and impact factors that were calculated by the transportation consultant are as follows (page 54):

- Risks due to accident involvements on local and regional access route;
- Spill frequencies on the local and regional access route;
- Transportation impacts on the local and regional access route;
- Transportation cost impact.

Factor and indicator risk and impact data were calculated for the 'typical operations' base case at 150 000 t/a and 300 000 t/a operating levels, as well as for the 'high solidified waste case' (page 55). The impacts and transportation risks associated with the OWMC facilities was determined by comparing the background conditions to conditions in the horizon years when the OWMC facility is under construction or in operation.

2.5 Mitigation

The purpose of Mitigation is to identify areas where transportation risks and impacts may be lessened through the implementation of corrective actions (page 11). A long list of potential measures were developed early during Phase 4B to provide insight to the data collection and analysis requirements (page 61). A number of these measures responded to concerns identified by agencies and during public meetings held by OWMC during earlier phases of the site selection activity (page 62). This "long list" of mitigative measures were reviewed based upon the results of the Phase 4B transportation risk and impact analyses in order to identify measures which respond to the potential risks and impacts (page 63). The residual impacts remaining after the implementation of the recommended mitigative measures are identified (page 11).

2.6 Monitoring

The purpose of the Monitor objective is to develop a program which will observe the transportation activities throughout the life of the facility in order to provide on-going documentation of the risks and impacts, and assess the effectiveness of the mitigation process (page 11). In this process, a potential monitoring program was identified, then these measures were studied in further detail to develop practical and effective monitoring procedures (page 65).

3. PREMISES AND POSTULATES

3.1 Premises

a) The special waste classifications and physical state premises remain basically unchanged from those assumed during the

Phase 4A analysis; however, the quantities of wastes anticipated for year five (1995) are exactly one half of those used for the purposes of the Phase 4A analysis (page 21).

b) Process quantities for all materials required at the OWMC waste treatment facility were developed by the site engineering consultant (Monenco Ltd.) (page 21). These quantities were accepted and adopted by OWMC.

c) For purposes of the transportation analysis, it was recommended that a mid-range value of 8.2% of drummed wastes be applied (page 24).

d) Rail service to the site has not been considered as part of the Phase 4B site assessment analysis (page 24).

e) The annual quantities of granular materials to be delivered to the site landfill area, and the annual quantities of surplus earth and clay materials to be exported from the site for disposal during construction and operations were defined and supplied to the transportation consultant (Page 25). These annual quantity estimates were accepted and adopted by OWMC.

f) The construction plan and schedule, which provided essential inputs to the Phase 4B transportation analysis was developed by Monenco Ltd. (Page 26). This plan and work schedule was accepted and adopted by OWMC.

g) Estimates of site employment by work shifts during the operation of the plant were developed by the OWMC Operations group and supplied to the transportation consultant (Page 28).

h) Based on the conclusions arising from a special study of all access options (by M.M. Dillon Ltd.), the Phase 4B transportation analyses were based on a Schram Road site entrance to the treatment facility (Page 29).

3.2 Postulates

a) The truck capacity and load size for special waste deliveries to OWMC remain the same as those applied in Phase 4A with the exception of drummed wastes which are assumed to arrive in 12-tonne loads/shipment.

b) During initial construction, clay materials are expected to be transported in shipment sizes of 11 cubic meters. For operations, the clay material was assumed to be transported in 14 cubic meter truck loads (Page 26).

c) Granular materials are assumed to be hauled to the site in 30-tonne loads (page 26).

d) The Vineland quarry immediately west of Niagara Regional Road 24 on Niagara Regional Road 73 was selected as the assumed disposal location for the excess clay materials. (However, no commitment has been made to date, and other disposal sites are under consideration) (page 31).

e) Since no historical accident data was available for Schram Road, it was assumed that the baseline condition would be equivalent to the 1983 to 1985 average for "all roads" in Ontario (page 32).

f) The Phase 4A factor of 1.37 was applied to the calculated all-vehicle accident involvement rates to estimate the accident involvement rate for medium and heavy trucks (page 32).

g) Three time horizons were identified for the transportation analysis (based on an assumed Environmental Assessment approval prior to 1990)(Page 33): Site Construction (1990); Year 5 Operation - 150 000 t/a (1995); Year 10 Operation - 300 000 t/a (2000).

h) The percent of heavy and medium trucks in the traffic stream along the local and regional access route was based on a 2 day traffic survey conducted by M.M. Dillon Ltd. in May, 1986 (page 34). It was assumed that this proportion of truck traffic would continue into the future years.

i) For purposes of the transportation analysis, an assumption was made regarding the use of private vehicles to convey the construction work force, and an average vehicle occupancy of 1.3 persons per vehicle during the peak construction period (page 35). An occupancy of one person per vehicle was assumed for employee movements during site operations.

4. STATUS OF DATA

The transportation information required to carry out the assessment of the preferred site was largely obtained through the govenment agencies associated with road operations along the preferred access route from the QEW to the site entrance, and field studies conducted by M.M. Dillon Limited (page 12). In addition, a certain amount of information was carried forward from the Phase 4A work and verified through more detailed studies during Phase 4B (page 36).

The Regional Municipality of Niagara, the Ontario Ministry of Transportation and Communications, and the Township of West Lincoln, provided information regarding the traffic, accident experience, and roadway geometrics for the access route. M.M. Dillon Limited carried out field studies in May, 1986 and 1987 to obtain current information on truck traffic on the access route (page 37).

5. MAIN FINDINGS

5.1 Verification/Update of Phase 4A Analysis

The updated traffic and accident information available during Phase 4B did not significantly alter the findings of the Phase 4A transportation analysis (Appendix A).

5.2 Baseline Conditions

The results of these analyses indicates that the road sections and intersections along the access routes are expected to operate at acceptable levels-of-service (Level "C" or better) in the horizon years (page 76). Since the analyses of baseline conditions are largely dependent upon information and forecasts made by the road agencies in their 1984 or 1985 Road Need Studies, it is recommended that the future updates to these studies, occurring in 1989 and 1990, be reviewed to discern any changes which may occur that could modify expected future baseline conditions (page 79).

The accident experience on the access road as it relates to 1
weather conditions is typical for the Niagara Region. There were

no school bus accidents, and only two farm vehicle incidents during the three year study period (page 76).

5.3 Risk and Impact Assessment

During the year 1995 when the treatment plant processes 150 000 t/a of special wastes under typical operations, it is anticipated that the total frequency of all spills will be 1 every 3.3 years (Special Wastes: 1 every 3.8 years; Additives/Reagents: 1 every 25.6 years). In work done by others (Environ, 1987) it was noted that only a portion of these spills would pose a risk to human health and environment (page 139).

Accident frequency for the 150 000 t/a typical operation was estimated at 2.37 accident involvements per year, representing a 1.6% increase in the 1995 background conditions without OWMC operation. Fatal accident involvements as a consequence of OWMC operation are expected at the rate of 1 per 34.8 years, and injurious type accident involvement at one every 1.4 years (pages 139 and 140).

The construction and operation of the OWMC facility results in the need to upgrade the intersection of Schram Road/Highway 20, and to rebuild Schram Road between Highway 20 and Vaughan Road (page 140).

The OWMC generated traffic can be accommodated within the existing capacity of the access road and intersections while maintaining an acceptable level-of-service (page 141).

The expanded operating capacity of the OWMC facility by year 2000 (300 000 t/a) will almost double the annual trucking requirement, and increase work day traffic by 52% (page 158).

As a result, special waste and additive/reagent spill frequency is one every 1.7 years, annual accident involvements total 4.42, representing a 2.6% increase over year 2000 baseline conditions (pages 158 and 160).

Fatal accident involvement risk is one every 17.8 years, and injurious accident involvement risk would occur at a rate of 1.3 per year under the 300 000 t/a typical operation (page 160).

Impacts on traffic operation in year 2000 will be minimal except on Schram Road and its intersection with Highway 20 where major modifications will be required as noted earlier (page 160).

The risks and impacts associated with the operation of the waste treatment facility are sensitive to an increase in the quantity of high solidified waste in the treatment process. The high solidified waste scenario tends to increase the traffic risks impacts as a result of the need for increased transportation due to additional additives and reagents required and the increased amounts of clay material to export off-site, and granular material to import (pages 161, and 168).

5.4 Mitigation

To provide a number of benchmarks upon which the acceptability of the OWMC generated traffic operations surcharge may be judged (since no thresholds of acceptability are established), an initial analysis was undertaken to demonstrate the change in risk related values as a result of growth of background traffic on the local and regional access routes (page 173). The percent change between benchmark values, with and without OWMC operations, provides a basis for judging the acceptability of the added impacts and the need for mitigation (page 174).

In dealing with accident involvement impacts, comparisons are made between the number of involvements estimated to occur with and without OWMC site operations for the horizon years 1995 and 2000. Based on this comparison it was concluded that the 2.5% increase resulting from full capacity OWMC operations is approximately equivalent to a one-year growth in background traffic accident involvement (page 180 and 181). The actual change in frequency of annual accident involvement due to OWMC operations is small and falls within the range of variance that exists when compared to the actual experience for years 1983 to 1985 (page 177).

Based on the risk analysis investigations conducted by Environ Corporation in 1987 report, Site Assessment Phase 4B - Risk Assessment, it was concluded that the frequency of a significant spill as a result of a motor vehicle accident on the access road posing a risk to humah health and/or the environment was approximately 1 spill in 50 years or more when the facility is treating 300 000 t/a of special wastes. Since this frequency exceeds the expected operating life of the OWMC facility it was concluded that spill risk has a low significance (page 182).

The following summary conclusions identify the transportation impact mitigative requirements associated with OWMC operations (page 189 and 190).

- Upgrade Schram Road to provide a two-lane paved roadway cross-section with widened shoulders and pavement structure to support the vehicle loading anticipated. Four site entrances are required to be constructed from Schram Road into the OWMC facility.

- One emergency access is required to access Highway 20.
- The modification and upgrading of Highway 20/Schram Road/ Silverdale Road, so that OWMC generated traffic demands may be safely accommodated.
- The traffic impact on the remainder of the access route is minor, therefore no mitigative measures are warranted.
- The predicted change in annual accident involvements on the access route due to OWMC operations are insufficent to warrant application of mitigative measures.
- The OWMC has proposed an outline for an emergency response plan to deal with the potential spillage of materials on the access route (discussions with municipalities through which OWMC related traffic would move are ongoing).

Residual risks and impacts were identified at the Highway 20/ Schram Road intersection where mitigative measures would reduce delays to through traffic and minimize potential for rear-end collisions, however the residual impact of the additional turning volumes as a result of OWMC generated traffic will remain (page 192).

5.5 Monitoring

A monitoring program has been developed to ensure that the predicted risks and impacts associated with the transportation component of OWMC site operations are minimized with respect to the defined goals of OWMC (page 201). This program includes the following considerations:

- Adherence to preferred routes (page 206);

- Frequency of OWMC generated vehicle accident involvement and spills (page 208);

- Other monitoring requirements based on OWMC corporate commitments (page 209).

5.6 Facility Decommissioning

Due to the current lack of quantitative information and a time schedule, the transport needs and resulting impacts cannot be determined for site closure. However, it has been possible to identify the types of transport movements that will likely be required during the decommissioning process (page 214).

The following transportation concerns will be addressed for decommissioning:

- Access Routes (page 214);

- Possible Transport Needs (page 215):
  - labour force;
  - process equipment and storage;
  - facility dismantling;
  - site redevelopment;
  - leachate disposal.

From the current perspective, it is believed that the transportation requirements associated with decommissioning and closedown of the site will be parallel to but less intensive than that associated with original plant construction (page 217).

6. CONCLUSIONS AND RECOMMENDATIONS

The transportation assessment of the preferred site has lead to a number of conclusions regarding the impacts and risks associated with the operation of the OWMC waste treatment facility:

- OWMC operations will have a very minor impact on accident involvement frequencies (page 175).
- The addition of OWMC traffic on the access route would have a smaller impact than that incurred each year as a result of growth in background traffic risk (page 181).
- The spill frequencies calculated in the transportation analyses in combination with the risk analyses conducted by Environ Corporation indicates that the frequency of a significant spill, as a result of a motor vehicle accident, posing a risk to human health and/or the environment (via the air pathway) was approximately 1 spill every 50 years or more when operating at the 300 000 t/a capacity. Since this exceeds the operating life of the facility, such a spill risk has a low significance (page 182).
- Existing conditions on Schram Road and at its intersection with Highway 20 are not sufficient to accommodate the additional traffic surcharge anticipated (page 184).

The study has presented the following recommendations regarding the mitigation of impacts, and the monitoring of the conditions along the access route:

- Improvements to Schram Road and its intersection with Highway 20 should be carried out to safely and efficiently accommodate the traffic demands (page 189, 190 and Appendix D).

- It is desirable to maximize assurance that the selected route is used and other routing alternatives avoided (page 206).

- With co-operation of OPP and Niagara Region Police Force, OWMC should monitor the overall frequency of accident events and spill events associated with OWMC generated trucking (page 208).

GLOSSARY OF TERMS AND ABBREVIATIONS

1. **Accident Event:** A motor vehicle collisions which causes death, injury, or property damage exceeding a certain dollar value. In Ontario, the threshold property damage values changed from $200 to $400 in 1978, and from $400 to $700 in 1985.

2. **Accident Frequency Rate:** A rate calculated based upon the annual number of accident events occurring on a road section or link divided by the annual vehicle exposure on the section or link. Exposure is measured as the annual number of vehicles using the road section, or alternatively, as the total annual vehicle kilometers of travel. In both cases the rate is usually expressed as number of events per one million vehicles (MV) or per one million vehicle kilometers (MV km).

3. **Accident Involvement Rate:** A rate calculated on a similar basis to an accident frequency rate except that the total number of vehicles involved in the accident events on a road section or link is substituted for the number of accident events. The primary advantage associated with this rate calculation is that it becomes possible to discern the difference in accident involvement frequency for various motor vehicle types (e.g. passenger vehicles, trucks, motorcycles, etc.), based on the disaggregate vehicle exposure per MV km for the individual vehicle types.

4. **Accident Involvement Risk:** As used in this report this term refers to human health risk as a result of a motor vehicle accident event. Thus, only fatal and injury producing accident events are considered.

5. **Accident (Motor Vehicle):** See Accident Event.

6. **Additives and Reagents:** These are defined as the chemical agents (elements or compounds) which are used at a special waste treatment facility to treat and neutralize special wastes and to produce a solidification of residues for safe disposal in a landfill.

7. **A/R:** An abbreviation for Additives and Reagents.

8. **AADT:** An abbreviation for Annual Average Daily Traffic.

9. **Annual Average Daily Traffic:** A traffic engineering term which is defined as the total calendar yearly volume of traffic travelling a road section or link divided by the number of days in the year.

10. **Background Traffic:** As used in this report background traffic refers to existing traffic volumes, or forecasted future traffic volumes expected to occur on a road section or link exclusive of the added traffic volumes anticipated to be generated by the OWMC waste treatment facility.

11. **Baseline Traffic:** Is defined as Background Traffic existing or forecasted to occur on various road sections for the OWMC impact assessment analyses horizon years of 1986, 1990, 1995 and 2000.

12. **Capacity (Roadway):** The maximum number of vehicles which has a reasonalbe expectation of passing over a given section of a lane or roadway in one direction (or in both directions on a two-lane or three-lane highway) during a given time period under prevailing roadway and traffic conditions.

    Prevailing conditions may be divided into two general groups:

    - prevailing roadway conditions, established by the physical features of the roadway and relatively unchanging from day to day;

    - prevailing traffic conditions, which are dependent on the nature of traffic on the roadway and thus may change daily or even hourly.

    Also, see Level-of-Service.

13. **C/G:** An abbreviation used for Clay and Granular materials.

15. **Continuous Excavation:** The term used to describe the process whereby the landfill area development procedure becomes a continuous operation in advance of the placement of solidified waste.

16. **Dangerous Goods Vehicle:** A vehicle conveying any commodity identified as such and requiring placarding under existing Transportation of Dangerous Goods Regulations.

17. **Design Hour Volume:** The estimated peak hourly volume for the future facility design year. Depending upon road class, the estimated future 15th, 30th and 50th highest annual hour is commonly selected for design.

18. **DHV:** The abbreviation used for Design Hour Volume.

19. **Level-of-Service:** Is a term which, broadly interpreted, denotes any one of an infinite number of differing combinations operating conditions that may occur on a given lane or roadway when it is accommodating various traffic volumes. It is a qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort, convenience and operating costs.

    Definition of the six levels-of-service are presented in report Table 2.7.

20. **LF-9C:** This represents the abbreviated form of identification used in Phase 4A of the site selection process to identify the Preferred Site, located to the east of Bismarck, in the Township of West Lincoln.

21. **LOS:** The abbreviation for Level-of-Service.

22. **MTC:** The abbreviation used for the Ontario Ministry of Transportation and Communications.

23. **/MV km:** The abbreviation used to represent the term 'per million vehicles kilometers', in expressing Accident Frequency Rate or Accident Involvement Rate.

24. **NRR:** The abbreviation used for Niagara Regional Road in reference to the road numbers assigned by the Regional Municipality of Niagara to identify roads under their jurisdiction.

25. **OPP:** The abbreviation used for Ontario Provincial Police.

26. **Peak Hour Volume:** The maximum hourly traffic volume occurring during a typical day on a road link or at an intersection.

27. **Preferred Access Route:** The preferred local and regional access route to the LF-9C site was identified during Phase 4A site selection. It is NRR 24 between the QEW and Highway 20, and Highway 20 from the NNR 24/Highway 20 intersection to Schram Road. The balance of this route (Schram Road) was selected during Phase 4B site assessment.

28. **Preferred Site:** The preferred site is LF-9C located to the east of Bismarck in the Township of West Lincoln.

29. **Preliminary Design:** A term used to describe the initial stage of facility design, at which time various assumptions

are made to define the improvement requirements. Cost estimates are frequently with the range of ±25% of the final cost estimates developed following final design.

30. **RMN:** The abbreviation used to represent the 'Regional Municipality of Niagara'.

31. **Road Link (Section):** The term used in this report to define the various sections of a route or highway. Each link has been defined by the appropriate road authority as a part of their routine update of the Roads Needs Inventory.

32. **Special Wastes:** OWMC has defined this term as being synonymous with the phrases 'liquid industrial waste', 'hazardous waste', and 'waste requiring special treatment'. These are the wastes to be treated at the OWMC waste treatment facility.

33. **Spill Frequency:** The term used in quantifying the spillage of special wastes or additives and reagents as a consequency of a motor vehicle accident event involving a carrier hauling to the OWMC treatment facility, and/or spills resulting from a mechanical failure of some component of the transport equipment. The normal units used in defining this frequency is one spill every 'x' years.

34. **Storage Lane:** The general term used to define an auxiliary traffic lane that is provided to accommodate the deceleration and short term storage of left or right turning vehicles at an intersection.

35. **S.W.:** An abbreviation for the term 'Special Waste'.

36. **Trucks (Medium and Heavy):** For purposes of this analysis any commercial vehicle consisting of two or more axles and six or more tires was classified within the medium and heavy truck group.

37. **Workday:** Although parts of the OWMC facility will be operated around-the-clock for 365 days per year, a workday was defined as the 250 normal weekdays (excluding holidays) per year that the facility would be open to receive special wastes and additives and reagents. Impact assessment is based on these workdays.

CHAPTER 1

INTRODUCTION

1. PURPOSE

The overall purpose of the M.M. Dillon Limited, Site Assessment - Phase 4B: Transportation report, is to assist the Ontario Waste Management Corporation (OWMC) in the preparation of information essential to the environmental assessment required under the Ontario Environmental Assessment Act 1975. The specific objectives of the Phase 4B Site Assessment - Transportation are:

- Verify and/or update the findings of Phase 4A both for site selection and facility design as they relate to the Preferred Site;
- Define the existing environmental conditions (baseline) of the preferred siting option;
- Predict and assess the potential risk and impacts that may be associated with the proposed facility design and operations;
- Identify and develop appropriate mitigative measures to minimize the potential risk and impacts associated with proposed facility construction and operations, and examine residual impacts and risks;
- Identify and develop monitoring programs to determine the effectiveness of the mitigation and contingency measures in minimizing risk and impacts;
- Preparation of documentation in accordance with the requirements of Ontario's Environmental Assessment Act.

2. BACKGROUND TO PHASE 4B

The OWMC facilities development process is being undertaken in five phases. These are as illustrated in Figure 1.1

The Phase 4B: Site Assessment - Transportation report follows from the report, M.M. Dillon Limited, October 1985, Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Transportation.

This report is but one of a series of reports being prepared for the OWMC to assess the Preferred Site at the conclusion of Phase 4A: Site Selection Process. The preferred site location was announced on 26 September 1985 and is located in the Township of West Lincoln, Regional Municipality of Niagara as shown in Figure 1.2.

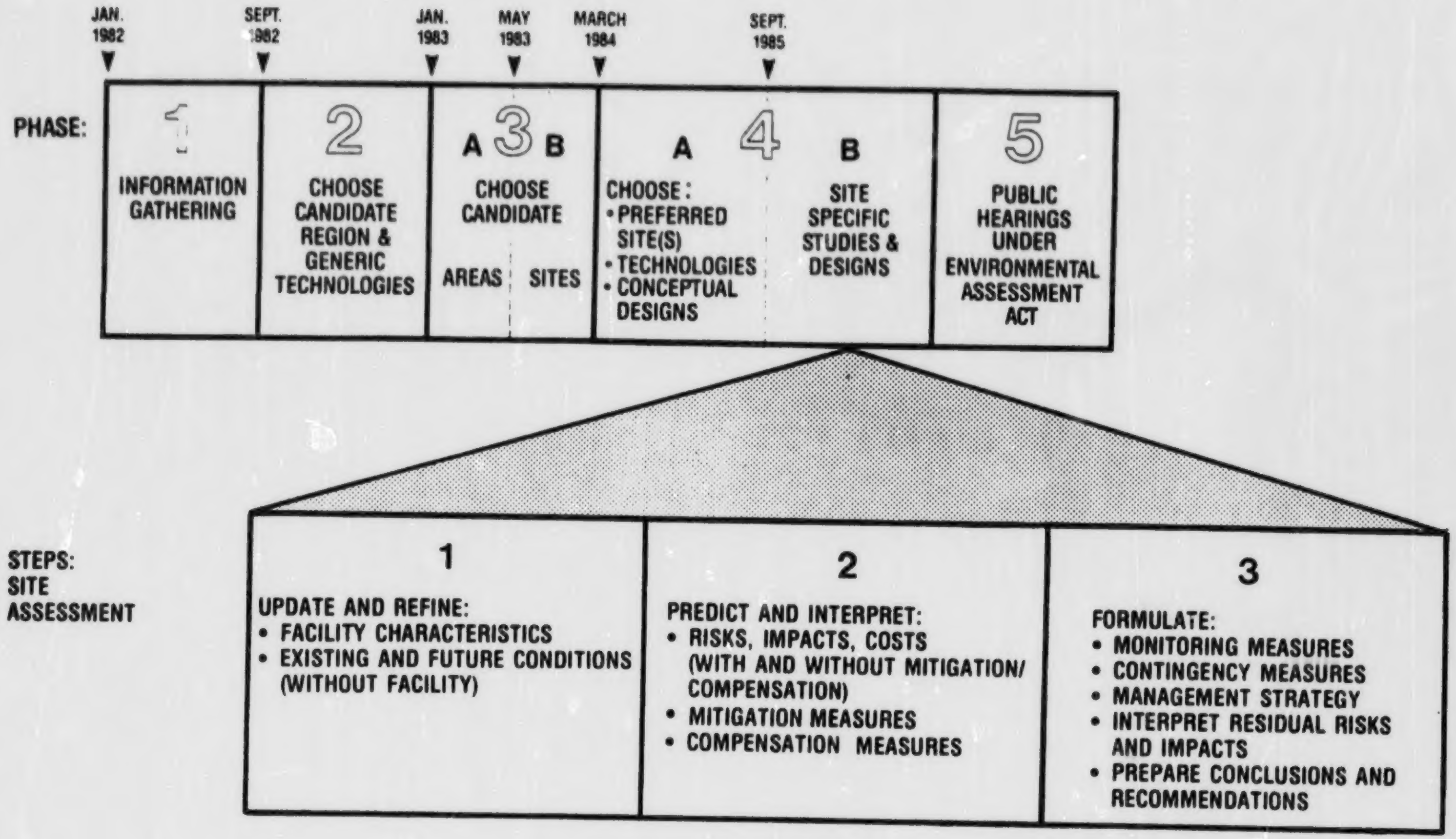
3. SCOPE - TRANSPORTATION ANALYSES

This section describes the general scope of the transportation analyses undertaken to meet the purpose and objectives of Phase 4B.

3.1 Study Areas

The study areas for this work include the following:

- site vicinity
- local and regional access routes, and
- other potentially affected roadways.


JAN. 1982
SEPT. 1982
JAN. 1983
MAY 1983
MARCH 1984
SEPT. 1985
PHASE:
1
INFORMATION GATHERING
2
CHOOSE CANDIDATE REGION & GENERIC TECHNOLOGIES
A 3 B
CHOOSE CANDIDATE
AREAS
SITES
A 4 B
CHOOSE:
• PREFERRED SITE(S)
• TECHNOLOGIES
• CONCEPTUAL DESIGNS
SITE SPECIFIC STUDIES & DESIGNS
5
PUBLIC HEARINGS UNDER ENVIRONMENTAL ASSESSMENT ACT
STEPS: SITE ASSESSMENT
1
UPDATE AND REFINE:
• FACILITY CHARACTERISTICS
• EXISTING AND FUTURE CONDITIONS (WITHOUT FACILITY)
2
PREDICT AND INTERPRET:
• RISKS, IMPACTS, COSTS (WITH AND WITHOUT MITIGATION/ COMPENSATION)
• MITIGATION MEASURES
• COMPENSATION MEASURES
3
FORMULATE:
• MONITORING MEASURES
• CONTINGENCY MEASURES
• MANAGEMENT STRATEGY
• INTERPRET RESIDUAL RISKS AND IMPACTS
• PREPARE CONCLUSIONS AND RECOMMENDATIONS

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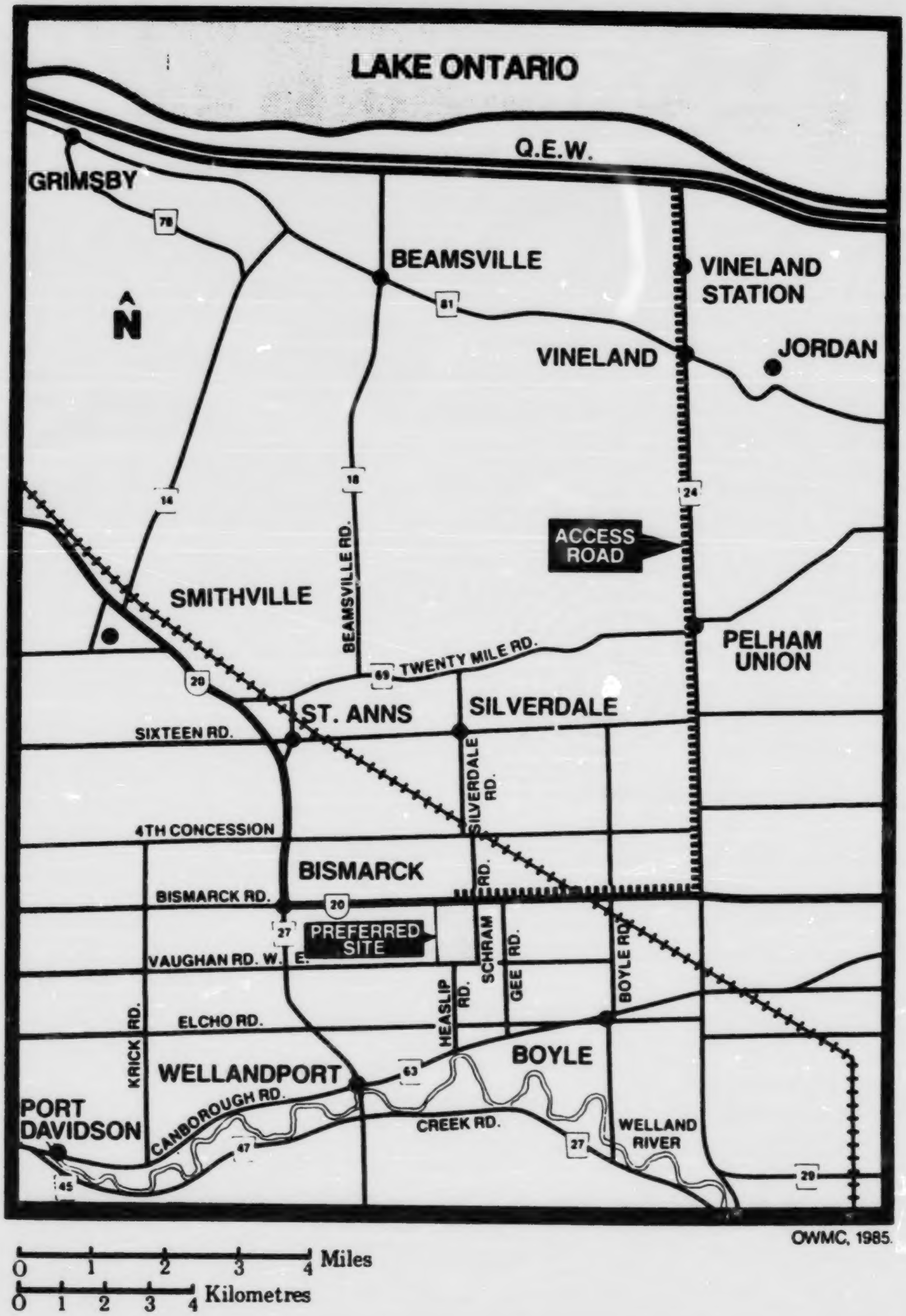
PHASE 4B: TRANSPORTATION

Facilities Development Process

Figure 1.1

Township of West Lincoln, Regional Municipality of Niagara. Local Detail.


LAKE ONTARIO
Q.E.W.
GRIMSBY
78
BEAMSVILLE
81
VINELAND STATION
VINELAND
JORDAN
N
14
18
24
ACCESS ROAD
BEAMSVILLE RD.
SMITHVILLE
PELHAM UNION
69
TWENTY MILE RD.
20
ST. ANNS
SILVERDALE
SIXTEEN RD.
SILVERDALE RD.
4TH CONCESSION
BISMARCK
SCHRAM RD.
BISMARCK RD.
20
27
PREFERRED SITE
VAUGHAN RD. W. E.
GEE RD.
BOYLE RD.
HEASLIP RD.
KRICK RD.
ELCHO RD.
BOYLE
WELLANDPORT
63
CANBOROUGH RD.
PORT DAVIDSON
CREEK RD.
47
27
WELLAND RIVER
45
29
0 1 2 3 4 Miles
0 1 2 3 4 Kilometres

OWMC, 1985.

OWMC Ontario Waste Management Corporation

PHASE 4B: TRANSPORTATION

Preferred Site
Figure 1.2

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No direct consideration was given to the Preferred Site proper other than at the entrances to the site from adjoining roadways. On-site transportation impacts have been addressed in other reports including:

- M.M. Dillon Limited, 1987: OWMC Environmental Assessment - Site Assessment Volume;
- Monenco Limited, 1987, OWMC Treatment Facility - Facility Description;
- M.M. Dillon Limited, 1986, OWMC Treatment Facility Process Area Report - Engineered Landfill;
- S.S. Wilson and Associates, 1987, Phase 4B: Site Assessment - Noise.

3.2 Risks, Impacts and Costs

During the Phase 4A detailed comparative evaluation undertaken for purposes of site selection, a considerable amount of information was collected to permit the consultants to evaluate and compare the risks, impacts and costs associated with the candidate siting options. With the selection of a preferred site, a need exists to verify and/or update the prior database to establish the current existing baseline information for the Preferred Site. Thus, from the transportation perspective all input data to the risk, impact and cost analyses has been reviewed and supplemented to produce an improved level of precision from that obtained during the prior Phase 4A activities.

Within the three study areas of specific interest, a need was identified to:

- Update the database on access route accident statistics from the original 1980 to 1982 period to the most recent data recorded during the 1983 to 1985 period;

- Confirm the number and percentage of medium and heavy transport vehicles operating on the local and regional access route system;

- Update total vehicle use on the access route system;

- Determine and assess the impacts associated with the construction of the planned facility;

- Refine and update the forecast of OWMC trucking requirements based on refinements to the planned facility operations;

- Reassess the transportation-related risks, impacts and costs associated with expanded information on facility operations;

- Conduct more detailed analyses of existing access route operation and accident types to discern potential ways and means by which operations could be improved and adverse events reduced; and

- Determine potential mitigation and monitoring requirements to ensure that the OWMC facility operations are properly controlled in a transportation sense to minimize associated risks and impacts.

4. APPROACH

The approach developed and applied for the Phase 4B transportation analyses parallelled the objectives of this phase as identified in Section 1 - Purpose. Major activities undertaken during this phase are identified in Figure 1.3. This figure summarizes the steps taken by all OWMC consultants as part of Site Assessment.

Although one of the study objectives was identified as the verification/updating of findings of the Phase 4A analyses, it was recognized that all transportation analyses were dynamic in nature as opposed to fixed or static elements. Several examples will probably best serve to illustrate the dynamic nature of the transportation-related risks and impacts:

- Spill and accident involvement risks, as developed during Phase 4A, are dependent upon historical accident frequency rates along the road links over which wastes, and additives and reagents are transported. These rates can and do vary over time as road conditions, traffic volumes, and the uses on adjoining lands change.

- Road user risks will vary over time depending on changes in traffic volumes and accident rates.

- Traffic noise impacts on adjoining sensitive uses will change as a function of the change in total traffic volume, percent of medium and heavy truck transport, and the number of sensitive uses within the affected noise corridor.

The Phase 4B data collection and analyses have endeavoured to strengthen the prior Phase 4A database and thereby improve the quality of the database and increase the reliability of baseline data and forecasts in relation to future site operations at the Preferred Site.

In addition to the improvement of the database for forecasting future conditions, it has been necessary to modify and/or update the Phase 4A assumptions on facility engineering and operations. As a result of more detailed engineering planning during the latter part of Phase 4A and the current Phase 4B activity, refinements have been identified which affect the transport needs and demands. This new information has lead to the need to update and refine the transport impacts and risk predictions to permit the identification of the most suitable mitigative measures required to minimize impacts and risks.

The refinements to site operations, engineering and transport requirements, also provides a more precise basis for the forecasting of site noise, and local and regional access route noise effects. With particular reference to site noise, these new data permit the examination of noise mitigative measures at noise sources and around the site perimeter to ensure that off-site noise levels are maintained at or below the levels recommended by the MOE guidelines.

The prior site selection analyses were undertaken on a "worst case" basis. That is, it was assumed that the facility would be operating at its maximum capacity of 300 000 tonnes per annum of special wastes which requires a doubling of initial design capacity. This approach produces the maximum trucking demands with respect to site operations, and approximately doubles the amount of trucking required when compared to operations at 150 000 t/a. As the initial facility development will be at this lower operating level it was necessary to assess these associated risks and impacts.

Site construction would occur within a two-year period following environmental approval and the completion of design. A substantial work force would be required and delivery of equipment and materials would also occur throughout this period. A special analysis was undertaken to forecast travel movements and associated impacts.

Monitoring programs were also developed for application once the facility is in operation. These were developed to ensure a minimization of risks and impacts associated with OWMC construction and operations.

5. ORGANIZATION OF REPORT

The report is presented in seven chapters and deals with all activities identified in Figure 1.3. The findings, conclusions and resulting recommendations are incorporated in the individual chapters rather than within a final chapter to this report. However, a summary of these are included in the Executive Summary which precedes Chapter 1.

Chapter 2: Methodology, presents the overall approach, data collection and methods employed in site assessment. This includes such items as:

- factor/indicator identification
- modifications to and new assumptions
- baseline condition approach, and
- approach to mitigation and monitoring

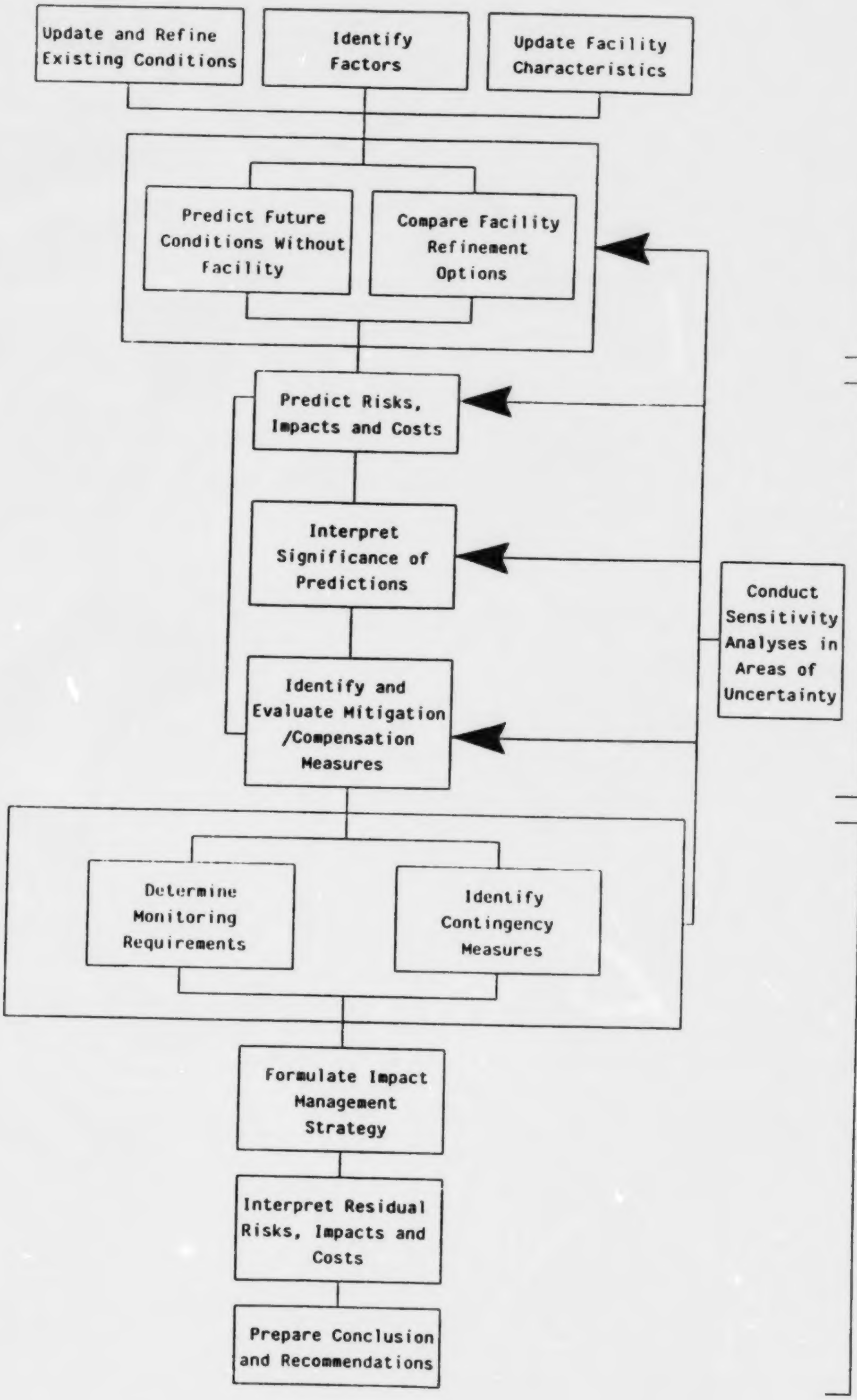
Chapter 3 presents the new data, the analysis of these data, and defines the now existing baseline conditions within study areas of the preferred site. The forecasting of future conditions on the local and regional access system to the site is also presented.

Chapter 4 addresses the changes in future conditions within the transportation study areas with and without OWMC site operations. Items to be considered for possible mitigation and monitoring are also identified.

Chapters 5 and 6 deal with possible mitigative measures to be undertaken and monitoring methods and procedures, respectively. Residual risks and impacts after mitigation were also assessed.

Chapter 7 discusses the transportation aspects of the site decommissioning phase.

Support data for the analyses and other documentation are included in the report appendices. Appendix A is of particular relevance in that it compares and examines the change in baseline data obtained during the site assessment process with data applied during Phase 4A and assesses the effects of these changes on transportation risks and impacts.


Update and Refine Existing Conditions
Identify Factors
Update Facility Characteristics
Predict Future Conditions Without Facility
Compare Facility Refinement Options
Predict Risks, Impacts and Costs
Interpret Significance of Predictions
Identify and Evaluate Mitigation /Compensation Measures
Conduct Sensitivity Analyses in Areas of Uncertainty
Determine Monitoring Requirements
Identify Contingency Measures
Formulate Impact Management Strategy
Interpret Residual Risks, Impacts and Costs
Prepare Conclusion and Recommendations

Step 1
Update and Refine:
- Facility Characteristics
- Existing and Future Condition (without facility)

Step 2
Predict and Interpret:
- Risks, Impacts and Costs (with and without mitigation/ compensation)
- Mitigation Measures
- Compensation Measures

Step 3
Formulate:
- Monitoring Measures
- Contingency Measures
- Management Strategy
- Interpret Residual Risks, Impacts and Costs
- Prepare Conclusions and Recommendations

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PHASE 4B: TRANSPORTATION

SITE ASSESSMENT PROCESS

Figure 1.3

CHAPTER 2

METHODOLOGY

1. INTRODUCTION

This chapter describes the approach used to carry out the transportation assessment of the Preferred Site for the OWMC waste treatment facilities. Included are an overview of the study methodology, data sources, assumptions, limitations, as well as the detailed approach used to achieve each objective of the site assessment program. This presentation of the study methodology indicates how both the previous stages, and new levels of analyses are applied to the transportation assessment of the preferred site.

1.1 Overview of Methodology

The Phase 4B Site Assessment builds on the earlier stages of the OWMC Site Selection Process, but exceeds the Phase 4A effort in terms of scope and level of detail. The five objectives of the assessment are as follows:

- Verify/update;
- Baseline;
- Risk and Impact Assessment;

- Mitigation;
- Monitor.

In the transportation program these objectives were applied to the following areas of study:

- site vicinity;
- preferred local and regional access routes;
- other potentially affected roadways.

The Verification/update objective deals with the review of the findings of Phase 4A as these relate to the Preferred Site. The Phase 4A transportation analyses were based upon a comparison of the relative transportation risks associated with a number of candidate siting options in order to assist in the selection of a siting option which would provide an acceptable level of risk. The purpose of the Verification/update objective is to investigate any changes in transportation risks which may occur due to the following:

- changes in existing traffic characteristics;
- changes resulting from more detailed transportation analyses.

The purpose of the Baseline objective is to establish the current and projected background conditions for the Preferred Site. The transportation baseline conditions deal with the preferred access route between the QEW and the site entrance. The following transportation components are considered to establish the baseline condition at the Preferred Site:

- accident rates;
- traffic volumes;
- traffic projections;

- percent heavy and medium trucks;
- roadway and intersection capacities and geometrics;
- proposed road improvements.

Transportation Risk and Impact Assessment deals with the risks and impacts associated with the use of the preferred access route from the QEW to the site entrance by the truck traffic generated by the waste treatment facility. The risk assessment portion considers the possibility of a spill and or a fatal/personal injury accident involving the truck traffic generated by the site, and the possible exposure of the environment to these events. A more detailed risk assessment is contained in the Environ Corporation 1987 Report Site Assessment Phase 4B - Risk Assessment. In the impact assessment the effects of the additional traffic in terms of total accident involvement, noise generation and traffic operations are considered. Three operation time horizons are considered for this assessment: initial construction period, year five operations (150 000 tonnes annually), and year ten operations (300 000 tonnes annually).

The purpose of the Mitigation objective is to identify areas where the effect of transportation risks and impacts may be lessened through the implementation of corrective actions. This is carried out through an examination of the results of the transportation risk and impact assessment leading to the development of a plan for reducing their effects. The residual risks impacts remaining after the implementation of the recommended mitigative measures are identified.

The purpose of the Monitoring objective is to develop a program which will observe the transportation activities throughout the life of the facility in order to provide on-going documentation of the risks and impacts, and assess the effectiveness of the mitigation process. The transportation monitoring program deals with the transportation related activities along the preferred access route to the site.

1.2 Data Sources

The transportation information required to carry out the assessment of the preferred site was largely obtained through the governmental agencies associated with roads along the preferred access route from the QEW to the site entrance, and field studies conducted by M.M. Dillon Limited. The Regional Municipality of Niagara provided information on Niagara Road 24, while the Ontario Ministry of Transportation and Communications provided information on Highway 20. Additional information on local roadways adjacent to the site was provided by the Township of West Lincoln.

Information supplied to other consultants is described in Chapter 4 Section 2.3.

1.3 Limitations

There is one limitation to the transportation analyses which is described fully in the following subsections to this chapter.

° the analysis is restricted to the preferred access route from the QEW to the site entrances, and does not consider risks or impacts along the provincial freeway system or within special waste generating zones. The risks associated with travel from the provincial freeway system to waste source sites were developed in the report, M.M. Dillon Limited, October 1985, Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Transportation, and remains unchanged.

2. TRANSPORTATION FACTORS AND DATA COLLECTION

2.1 Introduction

The transportation assessment of the Preferred Site deals mainly with the potential risks and impacts of the traffic generated by the site operation on the environment in the site vicinity and along the preferred access route between the QEW and site entrance. A number of factors have been developed to represent these risks and impacts, based upon the earlier transportation analysis for the Site Selection Process. However, the level of detail has increased over that applied during the earlier stages, and additional data collection has been undertaken.

2.2 Transportation Factors

The factors examined in the transportation assessment fall into two catagories: risks and impacts. The risk category deals with the possibility of a spill or accident involving truck or employee traffic generated by site construction, and operations. Impacts include the changes in traffic conditions along the preferred access route due to the implementation of the waste treatment centre.

These factors are considered as each objective of the assessment program is addressed. The Phase 4A risks and impact factors are verified or modified based upon updated data and more detailed analysis. The baseline conditions for the risks and impacts are established. The potential risks and impacts are quantified for the assessment. The means of mitigating the risks and impacts are developed. A program to monitor transportation risks and impacts is also to be established.

2.3 Data Collection

The data collection process involved gathering information from road agencies and field surveys, as well as from reports prepared for previous stages, and the facility design proposals prepared by Monenco Limited. Table 2.1 outlines the data requirements for each transportation factor considered in the assessment, and the source of this information.

3. TRANSPORTATION ASSUMPTIONS

The assumptions applied to the Phase 4B transportation assessment include some carried forward without modification from Phase 4A, some modifications to Phase 4A assumptions as well as new assumptions developed during Phase 4B. Table 2.2 lists the Phase 4A assumptions, indicating the rationale for those applied in the Phase 4B analyses or deleted after Phase 4A.

The following sections describe all new assumptions and the rationale for the modification to certain of the Phase 4A assumptions. Where Phase 4A assumptions have been carried forward and applied to Phase 4B analysis without modification, background reference should be made to the discussion in Chapter 2, Section 6 of the report, M.M. Dillon Limited. October 1985. Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Transportation.

TABLE 2.1
OWMC PHASE 4B - TRANSPORTATION
DATA SOURCES FOR TRANSPORTATION FACTORS

Transportation Factors	Data Required	Data Source
Risk:		
° Spill Frequency	- accident data	- Niagara Region (NRR 24) - MTC (Hwy 20)
	- spill potential due to accident	- Phase 4A transportation analysis
	- spill potential due to other in-transit events	- Phase 4A transportation analysis
	- number of OWMC generated waste vehicles	- Phase 4A transportation analysis
	- number of OWMC generated additive and reagent vehicles	- Phase 4B facility design revisions
° Accident Risks	- updated accident data	- Niagara Region (NRR 24) - MTC (Hwy 20)
	- number of OWMC generated special waste vehicles	- Phase 4A transportation analysis

TABLE 2.1
OWMC PHASE 4B - TRANSPORTATION
DATA SOURCES FOR TRANSPORTATION FACTORS
(continued)

Transportation Factors	Data Required	Data Source
	- number of OWMC generated additive and reagent vehicles	- Phase 4B facility design update by others
	- number of OWMC generated vehicles carrying excavated clay and granular materials	- Phase 4B landfill design update by others
	- number of OWMC generated employee work trips on Highway 20	- Phase 4B facil-design and operations by others
	- construction traffic volumes	- Phase 4B facility design and operations by others
° Access Road Noise	- existing traffic volumes	- Niagara Region (NRR 24) - MTC (Hwy 20)
	- expected growth in travel movement	- Niagara Region (NRR 24) - MTC (Hwy 20)
	- existing % heavy and medium trucks on access roads	- Phase 4A and B field surveys by M.M. Dillon
	- truck traffic (operations and construction)	- Phase 4B facility design and operations by others

TABLE 2.1
OWMC PHASE 4B - TRANSPORTATION
DATA SOURCES FOR TRANSPORTATION FACTORS
(continued)

Transportation Factors	Data Required	Data Source
° Traffic Operations	- existing road geometrics, proposed improvements, and existing and projected traffic volumes	- Niagara Region (NRR 24) - MTC (Hwy 20) - West Lincoln (Schram Rd.)
	- intersection geometrics, traffic signal timings and proposed improvements	- Niagara Region (NRR 24) - MTC (Hwy 20)
	- traffic volumes due to OWMC generated trucks and employment (operations and construction)	- Phase 4B facility design and operations by others

TABLE 2.2
OWMC PHASE 4B - TRANSPORTATION
STATUS OF PHASE 4A ASSUMPTIONS IN PHASE 4B

Assumptions	Status	Rationale
Premises		
° Waste Distribution (Scenario 2, St. Catharines/Niagara Subset)	Applied	- Same as Phase 4A
° Process flows to be analyzed	Modified	- Development of typical, and high solidified waste treatment cases (instead of partial and total solidification), to represent average and worst case operations respectively
° Drummed special wastes	Modified	- Change assumption from 3% in drums to 8.2% in drums
° Rail access to site	Modified	- Although Phase 4A had assumed rail as a possible opportunity for transport of additives and reagents, it is not considered in Phase 4B
° Quantities of granular import and clay export materials	New	- Landfill engineering provided quantity estimates for granular material required and exportation of surplus clay excavation during site operation
° Site construction work force	New	- Engineering provided construction workforce and equipment requirement estimates for site construction
° Site operations employment	New	- Operations provided estimates of site employment at two site operating levels

TABLE 2.2
OWMC PHASE 4B - TRANSPORTATION
STATUS OF PHASE 4A ASSUMPTIONS IN PHASE 4B
(continued)

Assumptions	Status	Rationale
° Site access	Modified	- Access to preferred site has been moved from Highway 20 to Schram Road to provide for multiple access points
° Transport of excess clay off-site during site construction	New	- Landfill engineering provided estimates of the size of vehicles and schedule for movements for construction period
Postulates		
° Mode for transporting special wastes	Applied	- Same as Phase 4A
° Transport vehicle types and sizes for special wastes, additives and reagents	Modified	- Drummed special wastes hauled in larger trucks (i.e. 12 tonne capacity). New A/R materials required transport vehicles
° Transport of granular and clay during operations	New	- Vehicle size selection - Transport costing - Determination of added accident involvement risk
° Vehicle transport costs	Modified	- Costing rules updated for Phase 4B
° Transport route accident frequency rates	Modified	- Only preferred access road was considered consisting of a regional road, a provincial highway and Schram Road - Accident rates for years 1983 to 1985 applied

TABLE 2.2
OWMC PHASE 4B - TRANSPORTATION
STATUS OF PHASE 4A ASSUMPTIONS IN PHASE 4B
(continued)

Assumptions	Status	Rationale
° Access road traffic volume growth	Modified	- Considered three scenarios: . construction (1990) . 150 000 tonnes per year (1995) . 300 000 tonnes per year (2000) - Work force trips considered in construction scenario
° Percentage of heavy truck traffic	Modified	- two weekday ten-hour counts on preferred access route used as basis for Phase 4B analysis
° Site construction workforce vehicle occupancy	New	- to convert workforce size into a number of vehicles to discern traffic operation and noise impacts
° Site operations employment vehicle occupancy	New	- to convert number of employees to vehicles for traffic operation and noise impacts

3.1 Premises

Premises fall within two categories:

- those defined by OWMC and provided to consultants, and
- those defined by other consultants, recommended to OWMC and accepted as assumptions to be applied by other consultants.

All modified or new premises are identified and discussed under the following sub-sections.

3.1.1 Process flows

Process quantities for all materials required at the OWMC waste treatment facility were developed by the site engineering consultant (Monenco Ltd). The special waste classifications and physical state premises remain basically unchanged from those assumed during the Phase 4A analysis; however, the quantities of wastes anticipated for year five (1995) are exactly one-half of those used for purposes of the Phase 4A analysis. The Phase 4A analysis assumed the year ten quantity of 300 000 t/a of special wastes for purposes of risk and impact assessment in site selection. The Phase 4B analysis of predicted changes in risks and impacts is based on both the year five and year ten capacity of the treatment plant.

The type and quantities of process additives and reagents required for treatment of wastes were modified as a result of more detailed site engineering. Because of the change in certain of the material requirements, new source locations and transport shipment size were defined and applied in the Phase 4B analysis, as required. A further modification was also developed by the engineering consultant which is applied as a sensitivity analysis in the transportation evaluation. These include two facilty operating scenarios:

- typical operations (base case), and
- high solidified waste (worst case).

The full description of the rational and derivation of each of these two scenarios is presented in the Monenco Limited. 1987 Report. Site Assessment Phase 4B: Facility Characteristics. From a transportation sense, the high solidified waste case represents the 'worst case' in terms of risks, impacts, and costs compared to the typical operations 'base case'.

Each of the operating cases developed produce a different need for the annual quantities of process additives and reagents used in the operating area; also, the annual quantities of solidified waste for year five, and year ten, affects the input/output quantities of granular materials and surplus clay material associated with the landfill operation. Table 2.3 presents information on the annual quantities of additives and reagent based on a facility throughput of 150 000 t/a of special wastes for each of the two operating cases. Information is also included on the physical state of the commodities, the individual shipment load sizes for the materials and the source locations assumed. Similar information for the changes in landfill material quantities, because of the different characteristics of the operating cases, is presented in sub-section 3.2.2.

It should be noted in Table 2.3 that for the 150 000 t/a operation individual additive and reagent quantities of less than 50 t/a have been excluded from the listing and subsequent transportation analysis. This is consistent with the approach

TABLE 2.3

OWMC PHASE 4B - TRANSPORTATION

ADDITIVE AND REAGENT QUANTITIES, SHIPMENT LOAD SIZE AND SOURCE LOCATIONS FOR OPERATING CASES AT 150 000 TONNES/ANNUM THROUGHPUT

ADDITIVES & REAGENTS	SHIPMENT LOAD SIZE (TONNES)	ANNUAL QUANTITIES FOR OPERATING CASES (TONNES)		PHYSICAL STATE	ASSUMED SOURCE LOCATIONS
		TYPICAL[2]	HIGH SOLIDIFIED WASTE[4]		
CEMENT	39	13 320	25 970	POWDER	MISSISSAUGA
SODIUM SILICATE	20	1 300	5 250	LIQUID	ETOBICOKE
CAUSTIC SODA	20	7 680	7 580	LIQUID	CORNWALL
LIME	24	1 980	1 980	POWDER	TORONTO
CARBON	20	275	275	GRANULES	HAMILTON
NITROGEN	4[3]	100	100	LIQUID	SCARBOUROUGH
CLAY	12	320	320	POWDER	TORONTO
FLY/ASH	10	320	320	POWDER	NANTICOKE
SULPHURIC ACID	20	731	731	LIQUID	TORONTO
SODIUM BISULPHITE	20	1 000	950	LIQUID	TORONTO
SODIUM HYPOCHLORITE	20	1 000	950	LIQUID	TORONTO
FILTER AID	5	51	51	POWDER	TORONTO
SALT	5	77	77	GRANULES	ST. CATHARINES

NOTES:

1. Additive and reagent quantities of less than 50 t/a, based on the 150 000 t/a facility and typical operation, are not included in this tabulation. Refer to text Sub-Section 3.1.1;

2. The typical quantities would be doubled for a 300 000 t/a facility;

3. For 300 000 t/a, the shipment size for nitrogen will be 8 tonnes.

4. The high solidified waste quantities would be doubled for a 300,000 t/a facility, except cement and caustic soda which are 200 tonnes/annum less than the doubled value.

5. Based on additive and reagent quantities, load sizes indicated by Monenco Limited 22 September 1987.

used in Phase 4A, wherein similar commodities were excluded when the annual requirement was less than 100 t/a at the 300 000 t/a special waste operating level. The total additive and reagent quantities thereby excluded amount to about 106 t/a for the typical 150 000 t/a operation scenario. This total includes nine commodities with a range in annual amounts required of 0.5 to 30 tonnes per annum. Thus, the quantity of additives and reagents excluded for purposes of the transportation assessment is less than 0.4% of the total quantities included.

3.1.2 Drummed special waste

The site engineering consultant (Monenco Ltd.) gave consideration to variations in the quantity of special wastes that may arrive at the treatment facility in 200 L drums. These variations were considered to be a part of a site sensitivity analysis. The range varied from 3%, (low drum scenario) which was the assumption used in the Phase 4A transportation analysis, to a design throughput of 12.2% (high drum scenario).

For purposes of the transportation analysis it was assumed that a mid-range value of 8.2% of drummed waste be used for the two scenarios.

3.1.3 Rail access to site

During the Phase 4A site selection analyses the use of rail service to sites for hauling bulk quantities of additives and reagents was considered an opportunity. This remains an opportunity with respect to Preferred Site and the preferred location of a rail corridor, should this be required in the future, was established. Consequently, rail service to the site has not been considered as a part of the Phase 4B site assessment analysis.

Had rail hauling of these materials been applied in the Phase 4B analyses, there would have been a slight reduction in road transport risks and impacts as demonstrated by the sensitivity analyses included in the Phase 4A Transportation report.

3.1.4 Quantities of granular import and clay export

The site engineering team evaluated landfill concepts (shallow entombment, conventional, and above-ground types) as well as landfill development methods (cell, trench and area). Each of these options in combination produce variations in the following:

- annual quantities of granular materials to be delivered to the site landfill area, and

- annual quantities of surplus earth and clay materials to be exported from the site for disposal.

The need for import and export of these materials was recognized during the Phase 4A comparative evaluation of candidate sites; however, no estimates of material quantities could be made at that time without decisions on the landfill types and development methods. This limitation did not directly affect the comparative analysis in that the requirements were viewed to be approximately the same for all candidate sites.

With the selection of the shallow entombment landfill type and area development placement methods, the quantities of materials requiring transport during construction and operations periods were defined and provided to the transportation consultant as shown in Table 2.4. It was assumed that the landfill development would be carried out on a continuous basis, requiring the initial excavation to take place during construction period only.

TABLE 2.4
OWMC PHASE 4B - TRANSPORTATION
GRANULAR MATERIAL IMPORT AND CLAY REMOVAL EXPORT FOR YEAR FIVE AND TEN LANDFILL OPERATING CASES AND CONSTRUCTION

	GRANULAR MATERIALS[1]		CLAY REMOVAL[2]	
ANALYSIS CASE	TONNES/ANNUM	SHIPMENT SIZE (TONNES)	CUBIC METERS/ ANNUM	SHIPMENT SIZE (C.M.)
Operations				
1. Year 5 @ 150 000 t/a				
a) Typical	7 100	30	109 872	14.0
b) High Solidified Waste	11 700	30	182 196	14.0
2. Year 10 @ 300 000 t/a				
a) Typical	13 900	30	217 098	14.0
b) High Solidified Waste	23 000	30	364 518	14.0
Construction				
a) COA Excavations	--	--	306 800	11.0
b) Landfill Site Developments	--	--	223 000	11.0
c) Initial Landfill Excavations	--	--	856 260	11.0

NOTES: 1. Source: Monenco Limited, 1986. OWMC Treatment Facility - Facility Description.

2. Source: M.M. Dillon Ltd. Memorandum 28 May 1987, SQUIRES TO BOOT, Update Annual Clay Quantities for Typical Operations and High Solidified (modified to represent continuous landfill); and Monenco Limited, 1987, Site Assessment Phase 4B - Facility Characteristics.

The transport of excess clay material to an off-site destination is expected to be completed within the initial year and a half of the construction period. The central operating area, and landfill site developments will be completed over a 10-month period while the initial landfill excavations are expected to require a 15-month schedule. During the initial 10-month period a total of 477 trucks carrying clay are expected to leave the site on a daily basis, while during the 5 final months, 247 truck trips would be expected.

3.1.5 Construction workforce

The site engineering consultant's report, Monenco Ltd. 1986. OWMC Treatment Facility - Facility Description developed a construction plan and schedule as a part of the environmental impact assessment of the site. This included a number of items that were essential inputs to the Phase 4B transportation and noise impact analysis of site development during the construction period.

Those inputs required for the transportation analysis are identified in this section, while those which were essential to noise analysis, e.g. on-site equipment and operations, are discussed in the report prepared by the noise consultant (S.S. Wilson and Associates).

The overall site construction period extends over a two-year period and was assumed to start in late 1989. The period of most intensive site construction activity, based on total daily site workforce and material delivery, was estimated to occur between mid-1990 and late spring 1991. The most traffic intensive period selected for analysis was late 1990 at which time it was forecast that the total on-site and site vicinity workforce would be for 627 employees and a total of 22 average daily (two-way) supply truck movements arriving and departing the site from the Schram Road/Highway 20 entrance. While it was noted that during other monthly time periods that a considerably larger number of material supply trucks would arrive/depart the site area, the overall effect would be less due to a reduced workforce. In addition there will be an additional movement of workforce and trucks moving on-site and from the south of the site to the site. As the scope of the transportation analysis is primarily limited to vehicle loadings occurring on Highway 20 and the Schram Road intersection and access, these other site/site vicinity movements are not considered further.

3.1.6 Site operations employment

Estimates of site employment during the operation of the plant for year five (150 000 t/a) and year ten (300 000 t/a) were developed by the OWMC Operaticns group and supplied to the transportation consultant. These were broken down by work shifts since work times vary for the various components of the operating area, laboratory, landfill and administration areas.

The total employment levels estimated by OWMC for year five operation was 151 persons, and 221 persons for year ten operation. These are the employment levels which were adjusted to represent the week day staffing levels for 250 days of the year by considering the shift schedule. Therefore the week day employees used for the transportation analysis were 142 persons for year five (150,000 tonnes/annum), and 209 persons for year ten (300,000 tonnes/annum).

The breakdown of week day employment by shifts for each operating period is as follows:

SHIFT	EMPLOYEES REQUIRED AT THE TWO OPERATING LEVELS	
	150 000 t/a	300 000 t/a
Day	109	156
Evening	21	26
Night	12	27
TOTAL EMPLOYMENT	142	209

3.1.7 Site access

During the Phase 4A comparative analysis it was assumed that all site access would occur directly from Highway 20. As a result of on-going engineering analysis (Monenco Ltd.) it became clear that access to the site could best be provided from Schram Road.

A special study of all access options was made and a report prepared, M.M. Dillon Limited 1987 OWMC Environmental Assessment: Volume 4 - Site Assessment. Based on the conclusions arising from this document, the Phase 4B transportation analyses were based on a Schram Road site access to the waste treatment facility.

Further discussion on the location of entrances to serve total site development and operations is presented in Chapter 4 of this report.

3.2 Postulates

The postulates developed by the transportation consultant for purposes of the Phase 4B site assessment are identified in the following sub-sections.

3.2.1 Transport vehicle type and size

The only modification to the Phase 4A vehicle type and size concerned those required for the transport of drummed waste. This change in drummed waste quantities was identified in sub-section 3.1.2 wherein the Phase 4B assumption has been increased from 3% of total waste receipt to 8.2%. This means that at year five of operations 12 280 tonnes/annum of waste could be received in 200 L drums, for an annual throughput of 61 400 drums.

The original assumption of vehicle load size was 9-tonnes/ load which was considered a conservative assumption, as much larger load sizes are practical and would reduce the unit cost of transport. Because of the much higher percentage of drummed wastes expected as well as the possibility to bulk-up shipments (addition of more drums), the Phase 4B assumption has been increased to 12-tonne loads/shipment.

Certain new truck load shipment sizes were identified for new additives and reagents materials which were developed by the engineering consultant as a part of Phase 4B site assessment. This was discussed in sub-section 3.1.1 and the new sizes are as set out in Table 2.3.

3.2.2 Transport of granular and clay

Sub-section 3.1.4 presents a discussion of the quantities of granular materials to be imported and clay material to be exported from the landfill operations and construction. The truck load shipment sizes assumed are as set out in Table 2.4. To complete the transportation inputs for Phase 4B Site Assessment required an assumption on the disposal location for the surplus clay and source area for the required granular material.

There are a large number of potential source areas for granular material and disposal areas for surplus clay within the Niagara area. Based on a preliminary survey of sites conducted by OWMC consultants, over 20 major pits and quarries were identified within the municipal areas of Pelham, Vineland, Beamsville, Grimsby, Port Colborne and Dunnville. The road travel distances from these source/disposal sites from OWMC Preferred Site range from 11 to 33 kilometers. However, it was considered impractical to establish at this time the actual source/disposal area(s) that would be used after OWMC operations commence in the 1990's. In the future this could involve tendering of granular supply and negotiations with the owners of worked out pits or quarries requiring earth for site rehabilitation.

The selection of an appropriate source/disposal area for these materials was therefore based on a 'worst case' approach. This suggests that any pit or quarry served from the preferred local and regional access route would maximize the accident involvement risk and social impacts, e.g. noise, and would therefore minimize the potential for under-estimating effects. Consequently, the Vineland quarry site immediately west of Niagara Regional Road 24 on Niagara Regional Road 73 (Fly Road) was selected for the transportation analysis (However, no commitment has been made to date, and other disposal sites are under consideration). This site is approximately 16.6 road kilometers removed from Preferred Site. Although other site options were identified which are closer to the Preferred Site, these do not produce a 'worst case' scenario.

This assumption of a disposal location was applied to the analysis of the year 5 and year 10 operations, and also for the disposal site during the construction period.

3.2.3 Transport route accident frequency

Phase 4B analysis focuses primarily on the site, site vicinity and local and regional access road system to the Preferred Site. To achieve this analysis objective for site assessment, the all-vehicle accident involvement rates were updated to reflect the most current data available. During Phase 4A the rates used for the provincial and regional road components of the system were based on the weighted average rates for the years 1980 through 1982. These were the most current data available during both Phase 3B and 4A of the site selection process.

During Phase 4B more recent all-vehicle accident involvement data were collected for the three-year period 1983 through 1985 on the local and regional access route. These data were supplied from the accident record data banks maintained by the Ministry of Transportation and Communications and the Regional Municipality of Niagara.

No all-vehicle accident involvement data were available during Phase 4A and 4B to establish the baseline conditions on Schram Road, which is under the jurisdiction of the Township of West Lincoln. Therefore, a baseline accident rate was assumed based upon the 1983-84 Ontario-wide accident event rate for "other roads" as published by the Ontario Ministry of Transportation and Communications. This all-vehicle accident rate of 4.85 accidents per million vehicle kilometers was converted to an accident involvement rate by applying the conversion factor of 1.635 as developed in Phase 4A. This produced a baseline accident involvement rate of 7.94 accident involvements per million vehicle kilometers for Schram Road and was applied in the analysis of baseline conditions.

It is anticipated that Schram Road would be improved to highway standards with the introduction of the OWMC facilities. Therefore, when estimating the number of accidents and spills associated with this road section during Phase 4B site operations, the weighted annual values for King's Highways in Ontario over years 1983-1984 were applied. This accident event rate of 1.13 accidents per million vehicle kilometers was converted to an involvement rate by applying the 1.635 factor from Phase 4A.

The updated all-vehicle accident involvement rates were calculated based upon the involvement data obtained from the road agencies. The Phase 4A factor of 1.37 was applied to the calculated all-vehicle involvement rate to estimate the accident involvement rate for medium and heavy trucks. The derivation of these adjustment factors has been documented in the report, M.M. Dillon Limited. October 1985. Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Transportation, Appendix J.

3.2.4 Access road traffic growth

The procedures applied in forecasting future traffic volumes on the local and regional access system remained unchanged from those applied during Phase 4A analysis. The analyses time horizons were however modified and certain new data were introduced to site assessment.

The three time horizons identified for the transportation analyses (based on an assumed Environmental Assessment approval prior to 1990):

- Site Construction: to assess the impacts and effects of activities associated with the development of the site, the year 1990 was selected;
- Year Five Operations: the year 1995 is the time assumed at which the OWMC facility would operate at the initial design capacity processing 150 000 t/a of special waste. Transportation-related risks and impacts were therefore assessed at this operating level;
- Year Ten Operations: year 2000 is assumed as the time which an expanded OWMC facility would operate at the ultimate processing capacity of 300 000 t/a of special wastes. The transportation-related risks and impacts at this operating level were developed for the verification of Phase 4A analyses and in a sensitivity analysis.

To address the site construction effects it was assumed that all workforce traffic and material transport to and from the site would be additive to the local and regional access route or other routes within the site vicinity. Thus, this temporary traffic was surcharged to the estimated future background traffic volumes.

For year five and ten operation of the site an approach was used similar to that applied during Phase 4A. All truck transport to and from the site for materials including special waste, additives and reagents, granular materials and removal of surplus clay, were surcharged to the estimated future background traffic volume forecasts for the years 1995 and 2000. However, no adjustment was made for employee and visitor trips to and from the site.

The addition of these trips to the local and regional access route system was assumed to be accounted for in the growth rates developed by the two road authorities for the road links involved with the exception of the 0.9 km section of Schram Road, its intersection with Highway 20, and Highway 20 to Regional Road 24. To develop design data required for the planning of road improvements at the entrance, all truck and private vehicle traffic was surcharged to the forecasted background traffic movements.

3.2.5 Percentage of heavy truck traffic

Phase 4A used the medium and heavy truck percentages developed from a series of vehicle classification short-counts made by the transportation consultant on all site local and regional access routes. To improve their reliability and to update the counts to reflect current baseline conditions, new classification counts were conducted and applied in the transportation and road noise impact analyses.

The classification volume counts were conducted on Monday 5 May 1986 and Tuesday 6 May 1986. To reflect background conditions existing during the assumed hours of OWMC generated truck transport, the counts were taken within the period 0700 to 1800 hours. Four counting locations were monitored including the north and south legs of the Niagara Regional Road 24 intersection with

Niagara Regional Road 81, and the north and west legs of the Niagara Regional Road 24 intersection with Highway 20.

An intermediate supplementary classification volume count was also included but on a shorter term basis at the north and south legs of Niagara Regional Road 24 and Niagara Regional Road 73, to provide an indication of possible change in truck percentages between the Niagara Regional Road 81 and Highway 20 intersections. The results of all counts were then used in the Phase 4B analysis.

3.2.6 Site construction and operations workforce vehicle occupancy

The calculation of vehicle trips in the conveyance of construction workforce required an assumption. The engineering consultant (Monenco Limited) suggested that a combination of vehicle types would likely be used including private vehicles, vans and buses. For purposes of the transportation analysis an assumption was made assuming the use of private vehicles and an average vehicle occupancy of 1.3 persons per vehicle during the peak construction month. This is considered to be a conservative assumption considering the geographic area from which the workforce trips would be generated. Other considerations in estimating the distribution of the workforce trips are presented in Chapter 4.

For purposes of estimating employee vehicle trip generation an assumption was required. Since no estimate was available concerning visitor trips to the site, justification exists for a conservative assumption on employee vehicle occupancy. Consequently, an occupancy of one person per vehicle was used. It was also recognized that some employees would likely make additional off-site trips during the working day. These could include off-site business meetings or for personal services, such as meals. To account for this assumed additional daily trip generation, the total work trip generation is assumed to increase by a minor amount.

3.2.7 Continuous Excavation of Landfill

The transportation analyses assumed that the excavation of landfill areas would be a continuous process such that the initial excavation of the landfill area would not be repeated after the contruction phase. It was also assumed that excess clay material would be hauled offsite.

4. VERIFICATION OF PHASE 4A ANALYSIS

4.1 Purpose and Scope

The purpose of this component of the site assessment is to confirm the results of the transportation analysis applied in the Phase 4A Site Selection process as they relate to the Preferred Site. During Phase 4A there were four transportation factors considered, all associated with the risk component:

a) Province-wide Hazard based Spill Index

b) Risks due to Hazard Based Spills on Local and Regional Access Routes

c) Province-wide Accident Involvements

d) Risks due to Accident Involvements on the Local and Regional Access Route

Factors a) and b) deal with the risks to the environment associated with any in-transit spill (with or without the occurrence of a motor vehicle accident event) of hazardous wastes, and additives/reagents. Factors c) and d) deal with the risks resulting from an accident involving trucks movements generated by the treatment facility. For all these factors the common components are the potential for an accident along the preferred access route from the QEW to the site entrance, and the number of trucks generated by the facility which will use the access route.

During the time between Phase 4A and Phase 4B, the existing and projected conditions on the access routes may have changed, therefore, it was necessary to re-examine the transportation statistics along the preferred local and regional access route to discern any significant variations. Changes in any of the following areas would have an effect on the transportation risks:

- accident rates
- proportion of medium and heavy trucks
- existing and projected traffic volumes
- road improvements

The significance of any changes which result from these considerations will be examined carefully in order to verify the findings of the earlier stages of site selection.

The results of the verification stage are presented and discussed in Appendix A to this report.

4.2 Data Collection

The inputs to this step were based on updated information obtained from the appropriate road agencies, and field studies conducted by M.M. Dillon Limited in May 1986. The remainder of the information was made available by other consultants involved in the assessment program.

The Regional Municipality of Niagara provided 1984 traffic conditions, estimated growth rates, and 1983 to 1985 accident report summaries for the appropriate sections of Niagara Regional

Communications provided 1984 and 1985 traffic conditions, and 1983 to 1985 accident report summaries for Highway 20 between Niagara Regional Road 24, and Schram Road. M.M. Dillon Limited carried out ten-hour vehicle classification studies for two consecutive days in May of 1986 in order to estimate the existing proportion of medium and heavy trucks along the access routes.

4.3 Analysis Procedures

4.3.1 Overview

The objective of the comparison was to discern any significant differences in the road statistics which may influence the findings of the Phase 4A Transportation risk assessment. In achieving this objective a series of statistical evaluations were carried out on the accident frequency data, and the changes in traffic volume projection were examined.

4.3.2 Comparison of transportation risk components (spills and accidents)

The Phase 4A transportation spill analysis was based on 1980 to 1982 accident data supplied by the Region of Niagara and MTC. During Phase 4B updated accident information was secured for years 1983, 1984, and 1985. By examining the difference between these two sets of data it is possible to estimate the resulting change in the risk of spills which may occur as a result of an accident event involving trucks generated by the waste treatment facility.

The level of detail was expanded during Phase 4B, as further details on the accident type, location, number of vehicles involved, and direction of vehicles was available. This type of information assisted with the more accurate assignment of accidents to different legs of an intersection. Previously, when this information was not available, accidents which occurred at an intersection were proportioned to each intersection leg according to the ratio of their AADT's. The expanded level of detail also affected the comparisons to Phase 4A data.

The following rules were applied to assign accidents to different legs of intersections:

- Accidents involving one or more vehicles travelling in the same direction are assigned to the approach leg of occurrence;
- Accidents involving vehicles from different approaches are proportioned according to the ratio of AADT's on the legs involved.

The statistics on the number of vehicles involved in accidents that were obtained in Phase 4B enabled the accident analysis to proceed directly to the calculation of an accident involvement rate. This approach avoids the use of the involvement rate conversion factors applied in Phase 4A, and therefore is a more accurate representation of the accident experience on the access route links. The formula used in calculating the accident involvement factor is described in sub-section 5.3.3.

Before carrying out the comparison to Phase 4A accident data, it was necessary to examine the differences in the 1983 to 1984, and 1985 data. This initial step was necessary because the Ontario criterion for reporting a "property damage only accident" was increased from $400 to $700 in January 1985. To determine if there were any differences between the two years of data, the following tests were conducted:

- Paired Comparison: calculate difference in accident involvement rates for each road section then estimate if the average difference is statistically different than zero.

- Proportion that are property damage: compare proportion of accidents which are property damage only for each data set.

Following the initial analysis the Phase 4A transportation risk components were computed based upon the updated road statistics. These components were compared to the values calculated based on the updated data and using statistical techniques to determine any significant differences. Table 2.5 lists the various tests and methodologies applied to examine the differences from the Phase 4A transportation risk components.

4.3.3 Comparison of background traffic volumes

The background traffic volumes for each phase of the OWMC analysis have changed during the study duration. In addition, growth factors and percentage of trucks have also changed for each phase. The significance of the changes to these traffic values and their possible impact on the Phase 4A results is examined during Phase 4B on the basis of statistical testing and value comparison.

Table 2.6 outlines the values compared and the methodologies applied to each comparison.

TABLE 2.5

OWMC PHASE 4B - TRANSPORTATION

PHASE 4A VERIFICATION STATISTICAL TESTS

TEST	COMPONENTS COMPARED	STATISTICAL TECHNIQUE	METHODOLOGY
1	- accident data from Phase 4A and new data	- t-test; paired comparison	- calculate difference in accident involvement rates on each access road link
2	- ratio of accident involvement rate to accident event rate	- t-test; one side	- calculate the average ratio over all years applied in Phase 4B - test if significantly different (+or-) from 1.635 applied in Phase 4B
3	- 2-way accident involvement per year (total solidification)	- as per Appendix Q in Phase 4A Transportation Appendices	- calculate 2-way accidents/year based on both data sets - determine if statistically different at 5% level
5	- Spills due to accidents/year (total solidification)	- as per Appendix Q in Phase 4A Transportation Appendices	- calculate number of spills/year due to accident for each data set - determine if statistically different at 5% level

TABLE 2.6

OWMC PHASE 4B - TRANSPORTATION

VERIFICATION OF PHASE 4A - BACKGROUND TRAFFIC VOLUMES

TEST	COMPONENTS COMPARED	STATISTICAL TECHNIQUE	METHODOLOGY
1	- % trucks on access roads as per Phase 4A and Phase 4B surveys.	- N/A	- compare each time period and truck percent change
2	- Projected traffic to each time frame	- N/A	- estimate future traffic using growth rates and existing traffic for Phase 4A and 4B

5. DEFINE BASELINE CONDITIONS

5.1 Purpose and Scope

The purpose of defining the baseline transportation conditions is to provide a basis for assessing the transportation risks and impacts associated with the proposed facility. In this study the baseline conditions were assessed for the year 1986 (existing) and each of the three future time horizons.

The transportation considerations in the baseline conditions analyses were selected to represent areas which may be influenced by an increased number of trucks generated by the OWMC treatment facility, or may be applied to estimate the number of accident involvements or spills related to travel to the treatment plant between the QEW and the site. Therefore the following items were chosen to represent the existing conditions along the local and regional access route:

- number of lanes
- paved width
- shoulder width
- right-of-way width
- 1983 to 1985 accident involvement rate
- percent of medium and heavy trucks in traffic flow
- annual average daily traffic (AADT)
- design hour volume (DHV)
- intersection capacity (Level-of-Service)
- traffic control at intersection

These items are input to road and intersection capacity analyses, and calculation of risks and impacts associated with facility construction and operations.

5.2 Data Sources

The transportation information applied to document the existing conditions was based on data obtained from the road agencies, and information collected during field observations by M.M. Dillon Limited. The data for Niagara Regional Road 24 were obtained from the Regional Municipality of Niagara; data for Highway 20 were obtained from the Ontario Ministry of Transportation and Communications. Field data were collected during two days of observations in May 1986.

5.3 Estimating Baseline Conditions

This section outlines the procedure applied to estimate the baseline conditions along the preferred local and regional access roads to the waste treatment site. There are four areas where baseline transportation condition were determined: road geometrics, traffic volumes, accident history, and intersection capacity.

5.3.1 Road geometrics

Road geometrics information was based on the Municipal Road Appraisal Sheets supplied by the road agencies. These information sheets are updated each year for minor details, while major updates take place every five years. The latest available data from the Niagara Region were compiled in 1985 and contain 1984 traffic volume information. The MTC data is based on 1985 traffic volumes. The sheets contain the following information applied to site assessment:

- road width; pavement, shoulder, and right-of-way
- number of lanes
- road capacity
- date of last road improvement, and surface type

5.3.2 Traffic volumes

Traffic volumes for the existing baseline conditions were obtained from the appropriate road agencies, via the Municipal Road appraisal sheets. Each agency also provided current estimates of traffic growth so that future baseline conditions could be estimated for each time horizon. The traffic volume data included both the annual average daily traffic, and the design hour volumes.

The estimated percentage of medium and heavy trucks on the access road was based upon traffic surveys conducted in May 1986 by M.M. Dillon Limited. These surveys consisted of two consecutive days of ten-hour counts at a total of four locations along the access routes: the north and south legs of the Niagara Regional Road 24/81 intersection, and the north and west legs of the intersection of Highway 20 at Niagara Regional Road 24. During these surveys the total traffic volume was counted and catagorized according to direction, number of trucks with six or more tires, school buses, and farm equipment, at each location.

5.3.3 Accident experience

The historical accident experience along the preferred access roads was calculated based largely on accident report summaries for years 1983 to 1985, with the exception of Schram Road where such reports were not available. The reports were examined to determine accident location, number of vehicles involved, and year that each accident event occurred. Particular attention was paid to accidents occurring in the vicinity of an intersection in order to determine which leg should be attributed with an accident event.

estimate the accident involvement rate along each road section for each year.

$$\text{Annual All-vehicle Accident Involvement Rate for link } i;\ \text{year "a"} = \frac{\text{Number of annual accident involvements on link "i"}}{\text{Annual average daily traffic (year "a")} \times 365 \times \text{section length (link "i")}} \times 10^{6}$$

An accident involvement rate representing the 1983 to 1985 period was calculated by estimating the average rate weighted by the AADT for each year. The formula for this calculation is as follows:

$$\text{Weight Annual Average All-vehicle Accident Involvement Rate for years a, to a+2} = \frac{\sum_{j=a}^{a+2} (\text{accident involvement rate for year "j"} \times \text{AADT year "j"})}{\sum_{j=a}^{a+2} (\text{AADT year } j)}$$

In order to estimate the number of accident involvements by trucks generated by the OWMC facilities it was necessary to calculate the accident rate which relates the number of truck accident involvements to the annual number of trucks on each road section. A relationship between all-vehicle accident involvements per all-vehicle exposure, and heavy/medium truck accident involvement per heavy/medium truck exposure was developed during Phase 4A based upon the accident experience on the New Jersey Turnpike (Dillon 1985, Appendix J). The New Jersey experience indicated that the accident involvement rate for heavy and medium trucks was 37% higher than the involvement rate for all-vehicles on the Turnpike.

This same relationship was applied to the Phase 4B analysis to convert the all-vehicle accident involvement rates to heavy/medium truck accident involvement rates, as follows.

> All vehicle accident involvement rate per million all-vehicle kilometers x 1.37 = heavy/medium truck accident involvement rate per million heavy/medium truck kilometers

In projecting the accident rates for the horizon time periods, it was reasoned that the existing accident rates would not change. This was based upon the province-wide trend in accident rates over the past 15 years as documented in the Phase 4A Transportation Report (Dillon 1985).

Historical data on accidents along Schram Road were not available. Therefore, baseline accident rate for this section of access route could not be determined and was estimated based on province-wide average for 'other roads'. The methodology for selecting the accident rate assumed is discussed in subsection 3.2.3.

5.3.4 Intersection capacity

The capacity and level-of-service at major intersections along the access route have an impact on the traffic operation of the route. Two signalized intersection were examined along the access route:

- Niagara Regional Road 24 at Niagara Regional Road 81
- Niagara Regional Road 24 at Highway 20

The capacity analysis was based on the MTC "short cut" method as described in the publication: A Method for Signal Timing Capacity Calculation and Level of Service Determination at Signalized Intersection, by W.E. Ewens in 1976. This method determines the level-of-service based on the following measures of the quality of traffic flow at an intersection:

- vehicle delay
- vehicle queue length at approach
- probability of a vehicle entering the intersection during the first green phase after arrival

Table 2.7 describes each of the levels-of-service in terms of these considerations. This table is based on the discussion contained in the MTC publication: Geometric Design Standards for Ontario Highways (1981) within Chapter B - Traffic and Capacity.

6. RISK AND IMPACT ASSESSMENT

6.1 Purpose and Scope

The following sections identify the risk and impact factors addressed in the site assessment phase of the analysis and the methods employed in the updating of the risks and impacts based on the forecasted baseline data.

Risk and impact factors and indicators employed in the current assessment are very similar to those developed and applied in Phase 4A of site selection. However, with the selection of the West Lincoln site the scope of analysis has been narrowed to the site/site vicinity and local and regional access road study areas. These are the transportation areas directly affected by refinements to site planning and engineering.

TABLE 2.7

OWMC PHASE 4B - TRANSPORTATION

DESCRIPTION OF LEVELS-OF-SERVICE AT INTERSECTIONS[1]

LEVEL OF SERVICE	DESCRIPTION OF OPERATION
A	At this level-of-service almost no signal phase is fully utilized by traffic. Very seldom does a vehicle wait longer than one red indication. The approach appears open, turning movements easily made and drivers have freedom of operation. The Poisson probability is that 95% of the time all vehicles arriving on one complete cycle will clear during the next green interval.
B	At this level, an occasional signal phase is fully utilized and many phases approach full use. Many drivers begin to feel somewhat restricted within platoons of vehicles approaching the intersection. Under rural conditions this level is suitable for rural intersection design. The Poisson probability is 90%.
C	At this level, the operation is stable though with more frequent fully utilized signal phases. Drivers feel more restricted and occasionally may have to wait more than one red signal indication, and queues may develop behind turning vehicles. This level is normally employed in urban intersection design. The Poisson probability is 75%.
D	At this level, the motorist experiences increasing restriction and instability of flow. There are substantial delays to approaching vehicles during short peaks within the peak period, but there are enough cycles with lower demand to permit occasional clearance of developing queues and prevent excessive back-ups. The Poisson probability is 60%.

TABLE 2.7
OWMC PHASE 4B - TRANSPORTATION
DESCRIPTION OF LEVELS-OF-SERVICE AT INTERSECTIONS[1]
(continued)

LEVEL OF SERVICE	DESCRIPTION OF OPERATION
E	At this level, capacity occurs. There are long queues of vehicles waiting upstream of the intersection and delays to vehicles may extend to several signal cycles. The Poisson probability is 50%.

Notes:

1. Extracted from the MTC publication: Geometric Design Standards for Ontario Highways 1981.

6.2 Rationale for Analysis Update

6.2.1 Facility engineering

A number of changes in facility design and operations have been identified which affect the results of the Phase 4A risk and impact analysis. These were identified and discussed in section 3 of this chapter. Table 2.8 provides a listing of the changes or new information and identifies whether or not these affect transportation risks or impacts.

The principal areas of change involved include:

- quantification of risks and impact for year five operations at 150 000 t/a of special waste in addition to the 300 000 t/a scenario;
- definition of the typical operation case with a sensitivity analysis of short term operating changes based on high solidified waste operating case;
- addition of a new transportation requirement for granular material required in the landfill operations coupled with the transport of surplus clay for disposal off-site.

6.2.2 Updated baseline data

The Phase 4B site assessment activities provided opportunities to review and collect current baseline information within specific areas that had been used during the prior phases in the forecasting of transportation risks and impacts. The area of study concerned the local and regional access road system from the QEW to the West Lincoln site.

TABLE 2.8

OWMC PHASE 4B - TRANSPORTATION

CURRENT FACILITY ENGINEERING ASSUMPTIONS

AND EFFECTS ON PHASE 4A TRANSPORTATION RISKS AND IMPACTS

FACILITY ASSUMPTION	EFFECT ON TRANSPORTATION RISKS AND IMPACTS
1. Waste Quantities	
. year 5 @ 150 000 t/a	- reduces effects
. year 10 @ 300 000 t/a	- no change
2. Process Flows	
. Typical Operation	- minor effects
. High Solidified Waste Case	- increases effects (short-term)
3. Increased Shipment of Drummed Waste Quantities	- no effect as drummed waste shipment vehicle size increased (see item 8)
4. Additional Transportation for Granular Material Import and Disposal of Excavated Clay Off-site	- increases effects of transport requirements as this was not included in prior analysis; - effects vary as quantities of materials vary as a function of 2. Process Flows
5. Consideration of Site Construction Requirements	- new item which increases transport requirements in the short term only
6. Site Operations Employment	- no effect as assumption modified except for immediate site area where entrance requirements are identified
7. Site Access Location	- slight increase in effects with change in access from Highway 20 to Schram Road
8. Transport Vehicle Types and Sizes	- no effect as increased size for vehicles hauling drummed waste compensates for increase in quantity of drummed wastes as per item 3 above

Table 2.9 provides a summary listing of the individual inputs that were confirmed or updated and were then applied in the calculations of transportation risks and impacts associated with site operations. Changes in baseline data also have implications in relation to work activities and risk and impact forecasts made by other consultants. Consequently, where changes or new baseline data were obtained, this information was provided to other consultants to be applied in their work. As an example, updated traffic volume forecasts and current information on medium and heavy truck percentages were supplied to the noise consultant (S.S. Wilson and Associates), to be used in their noise impact forecasts.

TABLE 2.9
OWMC PHASE 4B - TRANSPORTATION BASELINE TRAFFIC OPERATIONS AND SAFETY CHARACTERISTICS THAT AFFECT TRANSPORTATION RISKS AND IMPACTS

OPERATIONS AND SAFETY CHARACTERISTICS DATA INPUTS	EFFECT ON TRANSPORTATION RISKS AND IMPACTS
1. Transport Route Accident Frequency Rates	- change in rates on road sections has a direct effect on risk forecasts
2. Access Road Traffic Volumes	- change in volume levels may change traffic impacts, e.g. noise levels, levels-of-service, etc.
3. Forecast of Traffic Volume Growth	- change in forecasted volume levels may change future levels of impacts
4. Existing Medium and Heavy Truck Percentage	- change in existing percentage from that obtained earlier would affect noise impacts

6.3 Data Collection and Analysis

The data collection methods and procedures were presented earlier in various sub-sections to section 3.2 of this chapter. The particular reference sections include 3.2.3, 3.2.4, and 3.2.5.

The analysis methods, procedures and outputs paralleled those developed and applied in the Phase 4A analysis. This similar approach was adopted as the products of the analysis can then be compared with the results of Phase 4A to verify or update results. These comparisons are presented in Appendix A of this report.

The transportation risk and impact factors/indicators that were calculated by the transportation consultant are listed below:

- Risks due to accident involvements on the local and regional access route:
  - Frequency of fatal accidents
  - Frequency of injury accidents
- Spill frequencies on the local and regional access route:
  - Number of spills resulting from motor vehicle accidents
  - Number of other in-transit spills
- Transportation impacts on the local and regional access route:
  - Capacity deficiencies on access road links
  - Change in level-of-service at signalized intersections

- Transportation cost impact:
  - Special Wastes transport
  - Additives and reagent transport
  - Granular and clay transport
  - Total transport
  - Road and intersection improvement costs

Factor and indicator risk and impact data were calculated for the 'typical operations' base case at both 150 000 t/a and 300 000 t/a operating levels, as well as for the high solidified waste case. The latter scenario was developed and applied for purposes of a sensitivity analysis at the 150 000 t/a and 300 000 t/a operating levels.

7. MITIGATION

7.1 Purpose and Scope

This section describes the background considerations and methodological approach applied by the transportation consultant in the identification of impact management strategies to mitigate various impacts associated with the OWMC facility construction and operations.

The Phase 4B site assessment process gave primary consideration to impact prevention and/or minimization. This was addressed directly in the design and proposed operation of the facility. Unfortunately not all impacts are avoidable and these residual impacts are identified in this section. In certain instances the public has perceived impacts which have a low significance based on the results of the transportation analysis. These are also identified herein and are addressed in report Chapter 5.

Noise impact is outside the scope of this section as it will be addressed in a separate report by the noise consultant (S.S. Wilson and Associates).

The scope of the analysis considers the site/site vicinity and local and regional access road system study areas.

7.2 Transportation Impacts (Residual)

The primary transportation impact of the OWMC facility is a result of increased traffic generation on public roadways that serve the site area. This is a common feature associated with all industrial-type developments irrespective of the location of a facility. In the case of OWMC's Facility there would be employee vehicles as well commodity movements. The OWMC waste treatment facility will generate truck transport movements from a broad service area involving:

- shipments of special wastes requiring treatment at the facility

- shipments of additives and reagent materials used in the treatment of special wastes

- shipments of granular material to be used in the site landfill area, and

- shipments of surplus earth and clay material to be removed from the site landfill area to off-site destination(s).

The impacts associated with the total transport requirements will vary over time as a function of the activity levels at the site, on the public road system at the time of shipment, and by location (distance) and specific road access routes over which the transport movements occur. Using site generated traffic volume levels as an indicator of potential impact, maximum impacts would occur at the site entrance locations, which in this case are located along Schram Road. Farther away from Schram Road, the impacts would be diminished as the generated transport volumes are disbursed on various roadways. This occurs to a greater extent when considering employee generated work trips but to a lesser degree in relation to truck transport movements which are expected to use the defined local and regional access route. Another factor to be considered is the existing and anticipated future levels of traffic activity on the defined local and regional access route between the site and the primary inter-regional road network (the Queen Elizabeth Way). Activity levels and available road capacity vary for various road links of the overall system. Likewise, the effects (impacts) will vary depending upon existing conditions and added travel volume levels with, and without OMWC site operations.

While the primary effect of OWMC operations relate to increased traffic generation, there are important secondary effects of concern which must be addressed. These include:

- potential for the reduction in the level-of-service on access routes;

- increases in traffic noise levels due to an increase in total traffic and truck traffic;

- potential for an increase in the number of accident involvements and the associated risk to human health; and

- potential for the spillage of hazardous wastes or other dangerous goods which may pose human health or other environmental risks.

These potential impacts/risks associated with transportation are to be examined and the possible methods of mitigating these are also considered.

7.3 Data Sources

The information required for the analysis of transport impacts/risks within the two study areas considered, site/site vicinity and along the local and regional access route to the Preferred Site, were obtained from the following sources.

7.3.1 External sources

The Ministry of Transportation and Communications (MTC) and the Regional Municipality of Niagara (RMN) were the two principal external sources of information applied in the analyses undertaken. The types of data secured from these agencies included:

- Road inventory data for Highway 20 and NRR 24 including:
    - existing physical conditions
    - existing traffic characteristics
    - forecasted traffic growth levels
    - existing and forecasted deficiencies and type
    - existing accident frequency rates, accident types and locations
    - existing and forecasted levels of service
    - estimates of improvement construction costs and anticipated timing
    - existing intersection traffic volume turning movement counts, and
    - operational data on installed traffic signal equipment

- Historical road safety data on all roadways within their respective jurisdiction including annual summaries of accidents by:
  - annual accident frequency and rates
  - road conditions
  - weather conditions
  - time of day
  - number and types of vehicles involved, and
  - accident types and location

Although the original intention was to secure copies of the police accident reports for each occurrence within the three-year period (1983 through 1985), this was not possible for reasons of confidentiality. Consequently, secondary information sources were used by way of the internally generated summaries produced by each of the agencies.

The Township of West Lincoln supplied copies of the 1984 Roads Needs Study inventory sheets for Schram Road within the site vicinity.

The MTC and the Township of West Lincoln also received copies of road improvement proposals within the site/site vicinity and were requested to identify concerns and provide comments on the suitability of the planning proposals for site access improvements.

The findings of the survey of residents and community features along the access route conducted by the Institute of Environmental Research were also considered.

7.3.2 Internal sources

The main internal sources of traffic generation data were produced by the OWMC operations/marketing groups and the site engineering consultant (Monenco Ltd.). The types of data developed and applied by the transportation consultant have been identified in sections 2, 3 and 4 of this chapter. These included the following specific information:

- Site traffic generation and assignments for the three time horizons.

- Potential accident involvement frequency on the local and regional access system

- Potential spill frequencies for all waste, and additive and reagent commodity transport on the local and regional access system.

The transportation consultant also conducted vehicle classification counts at various locations on the local and regional access route to secure information on the number of existing medium and heavy truck movements. At these classification count locations supplementary information was also gathered on the frequency of school bus and agricultural vehicle movements.

Visual observations were also made of existing traffic operations along the entire local and regional access system to discern current operating characteristics.

7.4 Analysis Methodology

The general methodology employed by all OWMC consultants during the Phase 4B site assessment process is documented in Figure 1.3 (see Chapter 1). This figure provides a good overview of how mitigation was addressed in a general sense in terms of risks, impacts and costs.

Figure 2.1 provides more detail on the approach applied to the prediction of risks/impacts and the process applied for the identification of mitigative measures. This approach was applied by the transportation consultant and the potential for mitigation of the transportation effects occuring in the various time frames were addressed by the appropriate consulting disciplines. As an example, the transportation consultant provided forecasts of future vehicle and truck transport volumes on the local and regional site access route with and without OWMC operations. These were then applied by the noise consultant (S.S. Wilson and Associates) in their analysis of change in noise levels within the site vicinity and along the local and regional access route. Questions concerning the need for mitigation, mitigation potential, and cost and benefits associated with mitigation were then addressed. Where mitigation of noise levels was not feasible or sufficiently effective in meeting the noise level objective, compensation measures were then considered to minimize hardship of the affected party(s).

The transportation consultant's factors were risk and impact related. These factors are identified in Section 6.3.

The Phase 4B transportation work program gave consideration to potential mitigative measures that were viewed to be desirable based on the results of the Phase 4A analysis. A long list of potential measures was developed early during Phase 4B to provide insight to the data collection and analysis requirements. Also a number of these measures responded to concerns identified by agencies and the public at meetings held by OWMC during earlier phases of the site selection activity. The long list of potential measures considered included:

- road improvement requirements identified with and without OWMC facility development;

- comparison of land acquisition requirement options to existing public rights-of-way to accommodate improvements deemed essential;

- adequacy of existing traffic control devices to facilitate operations and maintain safe traffic flow;

- adequacy of existing speed limits considering adjacent land uses;

- adequacy of warning signage to identify special or unexpected conditions;

- suitability of operating hours of the facility;

- need for contingency parking facilities to accommodate transport shipments arriving outside of normal receiving hours;

- review of recent historical accident experience on the local and regional access system links to identify potential accident prone locations and methods to alleviate these;

- identify short-term alternative routing options to by-pass temporary obstructions that may occur along the designated access route (contingency planning);

- OWMC assist local emergency forces in the development of emergency response contingency measures;

- develop preliminary design plans for the safe design and operation of site access;

- develop monitoring measures to detect any missuse of the local and regional access road system so that corrective action can be taken;

- develop clear statements on the potential transport risks in order to overcome public concern based on incorrect or overstated perceptions;

- examine existing and forecasted future road capacity and levels-of-service to discern any future local and regional access road improvement needs;

- examine areas of public concern in relation to school bus and agricultural vehicle movements, and opportunities for risk reduction.

This "long list" of mitigative measures was reviewed based upon the results of the Phase 4B transportation risk and impact analyses, in order to identify those measures which respond to the potential risks and impacts. Also, further mitigative measures were developed to deal with any additional transportation risks or impact identified in the transportation analyses. The results of the mitigation analysis are discussed in Chapter 5 of this report.

8. MONITORING

8.1 Purpose and Scope

During the Phase 4B site assessment stage, a report was prepared dealing with mitigation and monitoring by, Ontario Waste Management Corporation, July 1986, OWMC's Waste Treatment and Disposal Facilities: Potential Impacts - Their Prevention and Management. Two types of monitoring were addressed in this report: performance monitoring and environmental monitoring.

From the transportation perspective and within the site vicinity and local and regional access route study areas environmental monitoring is required to prevent or ameloriate the resulting risks and impacts associated with truck movements to and from the facility. An appropriate monitoring program will produce timely information to detect changes in the now existing environmental conditions, as well as changes in these conditions attributable to OWMC operations.

The scope of this section is limited to the direct and indirect effects of transportation but excluding the noise impacts of transportation. Noise effects are to be included in a separate report prepared by the noise consultant (S.S. Wilson and Associates).

8.2 Background Considerations

Phase 4B site assessment was undertaken to define current baseline environmental conditions and then to forecast the change in these conditions with and without OWMC operations at the West Lincoln facility site. This activity involved the securance of current reports and information on the traffic characteristics of the identified local and regional access route over which most of the site destined transport will travel. Using this basic information supplemented by data collection on the existing traffic mix on the access route, forecasts were made of future background conditions at the time of facility construction, and at years five and ten of site operations. These forecasts coupled with the forecasts of OWMC traffic generation within the three time horizons were used to forecast risks and impacts.

Consequently, transportation monitoring must give consideration to changes in background traffic characteristics as well as the change in OWMC site operation over the analysis time horizons. Both changes in combination will produce effects on the local and regional access route.

8.3 Transportation Approach

The development of a transportation monitoring program was a two-staged process. The initial stage involved the identification of a potential monitoring program to respond to the transportation risks and impacts identified in the analyses. Each of these measures were studied in further detail in order to develop a procedure which would be practical, and effective in minimizing the potential risks and impacts and to supplement the mitigation measures.

The details on the development of this program are discussed in Chapter 6.

CHAPTER 3

BASELINE CONDITIONS

1. INTRODUCTION

The baseline conditions examined as part of the transportation analysis for site assessment dealt with the conditions along the preferred local and regional access route between the QEW, and the site entrance on Schram Road in West Lincoln Township (see Figure 1.2). The baseline conditions were used to establish the conditions which would exist without implementation of the OWMC facility. Three time horizons are considered for this analysis based on the assumed approval of the OWMC Environmental Assessment (see Section 3.2.4 of Chapter 2).

The estimated conditions for each of these time horizons were based on the existing conditions, and ten-year projections provided by the Ontario Ministry of Transportation and Communications, and the Regional Municipality of Niagara, for their respective roadways along the preferred route. These projections were then interpolated or extrapolated to the appropriate future horizon year.

2. ACCESS ROAD CONDITIONS

The access road conditions were assessed for each of the horizon time periods. The assessment included a number of roadway characteristics which may be affected by the additional truck traffic generated by OWMC activities, or may affect the possibility of spills or accidents along the access route. This section presents information on the existing 1986 baseline conditions and forecasts future baseline conditions excluding the effects of OWMC operations on the local and regional access route system.

A detailed examination of accident trends at specific locations along the route is contained in Appendix B.

2.1 Existing Baseline - 1986

Table 3.1 describes the existing conditions which were developed for the preferred local and regional access route. This table shows the estimated 1986 traffic volumes, these values were calculated based on the most recent traffic data available for each link, and the current annual compound growth rate.

Other data presented have been extracted from reports secured from the relevant agencies, from special studies conducted by the consultant, and field survey of existing operations. The data compiled in Table 3.1 form the basis for the prediction of future baseline conditions.

For purposes of predicting future baseline conditions in years 1990, 1995 and 2000 (see Chapter 2, Section 3.2.4 for definition of horizon years), it has been postulated that both the percent of medium and heavy trucks, and the existing accident involvement rates on each road section will remain unchanged throughout the future time horizons. This is not to say that no changes will occur on a year-to-year basis, but rather that they are likely to remain relatively stable over the analysis period.

TABLE 3.1

OWMC PHASE 4B - TRANSPORTATION

EXISTING BASELINE CONDITIONS (1986) ON PREFERRED LOCAL AND REGIONAL ACCESS ROADS

LINK DESCRIPTION	APPRAISAL SHEET NUMBER	1986^1 AADT (2 WAY)	1986^1 DHV (2 WAY)	ESTIMATED ANNUAL GROWTH RATE	1986 ESTIMATE % HEAVY TRUCKS^2	1983 - 1985 ACC INVOL/ MILL VEH KM	NUMBER OF LANES	PAVED WIDTH(m)	SHOULDER WIDTH(m)	ROW^3 WIDTH(m)	COMMENTS
A. Vineland Townline Road (NRR 24)											
1. QEW to NRR 81 (3.8 km)	NIA-2431	8 450	930	4.1%	19	2.28	4	14	0	20.1	2 parking lanes
2. NRR 81 to Moyer (0.7 km)	NIA-2428	7 510	900	5.1%	22	5.43	4	14	0	20.1	1 parking lane
3. Moyer to NRR 73 (1.1 km)	NIA-2425	7 510	900	5.1%	22	0.72	3	10.4	2.4	26.2	Southbound truck climbing lane
4. NRR 73 to Ninth Ave (3.5 km)	NIA-2422	6 070	730	4.1%	22	2.77	2	6.7	2.75	26.2	
5. Ninth Ave to NRR 216 (3.0 km)	NIA-2419	5 980	660	2.9%	22	2.70	2	6.7	2.15	30.5	
6. NRR 216 to Hwy 20 (4.1 km)	NIA-2416	4 990	550	2.9%	22	2.55	2	6.7	2.15	30.5	
B. Highway 20											
1. NRR 24 to Schram Road (5.1 km)	MTC-23730-2.9	3 420	370	0.6%	16	1.33	2	6.7	2.15	30.5±	Varies
C. Schram Road											
1. Hwy 20 to site (0.9)	WL-233	120	10	2.3%	3	N/A	2	6.1	0.9	20.0	Gravel road

NOTES:

1. Estimated from most current traffic volume information and growth factors.
2. From field survey by M.M. Dillon, May 1986.
3. ROW is abbrevation for roadway right-of-way.

2.2 Future Baseline - 1990

Table 3.2 presents the predicted baseline conditions for year 1990 at which time it is expected that the OWMC treatment facility would be under construction. The forecasts of future conditions for each road section of the local and regional access system are recorded including the percentage and average daily number of medium and heavy truck movements, and the all-vehicle accident involvement rate and annual number of vehicle accident involvements for the year 1990 operations.

It is noted that an all-vehicle accident involvement rate was assumed for Schram Road since no historical data were available. The rationale for the assumption was documented in Chapter 2, sub-section 3.2.3.

2.3 Future Baseline - 1995

Table 3.3 presents the forecasted conditions for the future year 1995. This is the year that the OWMC facility is assumed to process a throughput of 150 000 tonnes per annum of special wastes. The data provided in this table for year 1995 are to be used as the bases for the forecasting of change in risk and impact assessment with OWMC operations. Thus, information contained in Table 3.3 is applied in Chapter 4 - Risk and Impact Assessment.

2.4 Future Baseline - 2000

While the bases for the design of the initial OWMC waste treatment facility is for a throughput of 150 000 t/a, the ultimate capacity of an expanded treatment plant has been assumed to be 300 000 t/a. It was further assumed that the 300 000 t/a throughput level would occur during the year 2000; this remains consistent with the assumption developed and used during the Phase 4A site selection process for probable maximum risks and impact determination.

TABLE 3.2
OWMC PHASE 4B - TRANSPORTATION
BASELINE CONDITIONS ON LOCAL AND REGIONAL ACCESS ROUTE FOR YEAR 1990

					ALL-VEH ACC. INVOL.	
	YEAR 1990		HEAVY/MED TRUCKS		RATE	ESTIMATED
LINK DESCRIPTION	AADT	DHV	%	AVE DAILY	PER MILL VEH-KM	ANN. NUMBER
A. Vineland Townline Road (NRR 24)						
1. QEW to NRR 81	9 930	1 095	19	1 890	2.28	31
2. NRR 81 to Moyer	9 160	1 100	22	2 020	5.43	13
3. Moyer to NRR 73	9 160	1 100	22	2 020	0.72	3
4. NRR 73 to Ninth Ave.	7 130	860	22	1 570	2.77	25
5. Ninth Ave to NRR 216	6 710	740	22	1 470	2.70	20
6. NRR 216 to Hwy 20	5 590	615	22	1 230	2.55	21
B. Highway 20						
1. NRR 24 to Schram Rd.	3 500	380	16	560	1.33	9
C. Schram Road						
1. Hwy 20 to site	130	15	3	4	7.94[1]	<1

NOTES:

1. All-vehicle accident involvement rate was calculated from Ontario 'other roads' data for 1983-84.

TABLE 3.3
OWMC PHASE 4B - TRANSPORTATION
BASELINE CONDITIONS ON LOCAL AND REGIONAL ACCESS ROUTE FOR YEAR 1995

					ALL-VEH ACC. INVOL.	
	YEAR 1995		HEAVY/MED TRUCKS		RATE	ESTIMATED
LINK DESCRIPTION	AADT	DHV	%	AVE DAILY	PER MILL VEH-KM	ANN. NUMBER
A. Vineland Townline Road (NRR 24)						
1. QEW to NRR 81	12 140	1 340	19	2 310	2.28	38
2. NRR 81 to Moyer	11 750	1 410	22	2 580	5.43	16
3. Moyer to NRR 73	11 750	1 410	22	2 580	0.72	3
4. NRR 73 to Ninth Ave	8 710	1 050	22	1 920	2.77	31
5. Ninth Ave to NRR 216	7 740	850	22	1 700	2.70	23
6. NRR 216 to Hwy 20	6 450	710	22	1 420	2.55	25
B. Highway 20						
1. NRR 24 to Schram Rd.	3 610	390	16	580	1.33	9
C. Schram Road						
1. Hwy 20 to Site	150	15	3	5	7.94[1]	<1

NOTES:

1. All-vehicle accident involvement rate was calculated from Ontario 'other roads' data for 1983-84.

Table 3.4 sets out the predicted year 2000 baseline conditions expected to exist on the various sections of the local and regional access route system to the site. This information is therefore applied in the year 2000 risk and impact assessment developed in Chapter 4. It is also used in the verification of the Phase 4A results as reported in Appendix A.

3. INTERSECTION BASELINE CONDITIONS

Section 2 of this chapter presented baseline information on the eight road sections that constitute the preferred local and regional access route from the QEW to the Preferred Site. As two signalized arterial road intersections occur along the route, it is necessary to record and predict baseline conditions at these locations. This procedure is considered necessary since major road intersections are frequently the critical locations in terms of roadway capacity due to the interrupted traffic flow that occurs at these locations. The two intersections involved are:

i) Niagara Regional Road 24 at Niagara Regional Road 81
ii) Niagara Regional Road 24 at Highway 20

At intersection i), the existing baseline data available were collected for an eight-hour period in April 1985 by Niagara Region staff. The data obtained from this intersectional turning movement survey are presented in Figure 3.1. Similar information collected at intersection ii) was obtained by MTC staff in July 1983. These data are presented in Figure 3.2.

TABLE 3.4

OWMC PHASE 4B - TRANSPORTATION

BASELINE CONDITIONS ON LOCAL AND REGIONAL ACCESS ROUTE FOR YEAR 2000

					ALL-VEH ACC. INVOL.	
	YEAR 2000		HEAVY/MED TRUCKS		RATE	ESTIMATED
LINK DESCRIPTION	AADT	DHV	%	AVE DAILY	PER MILL VEH-KM	ANN. NUMBER
A. Vineland Townline Rd (NRR 24)						
1. QEW to NRR 81	14 830	1 630	19	2 820	2.28	47
2. NRR 81 to Moyer	15 070	1 810	22	3 320	5.43	21
3. Moyer to NRR 73	15 070	1 810	22	3 320	0.72	4
4. NRR 73 to Ninth Ave	10 650	1 280	22	2 340	2.77	38
5. Ninth to NRR 216	8 920	980	22	1 960	2.70	26
6. NRR 216 to Hwy 20	7 450	820	22	1 640	2.55	28
B. Highway 20						
1. NRR 24 to Schram Rd.	3 720	400	16	590	1.33	9
C. Schram Road						
1. Hwy 20 to site	160	15	3	5	7.94[1]	<1

NOTES:

1. All-vehicle accident involvement rate was calculated from Ontario 'other roads' data for 1983-84.

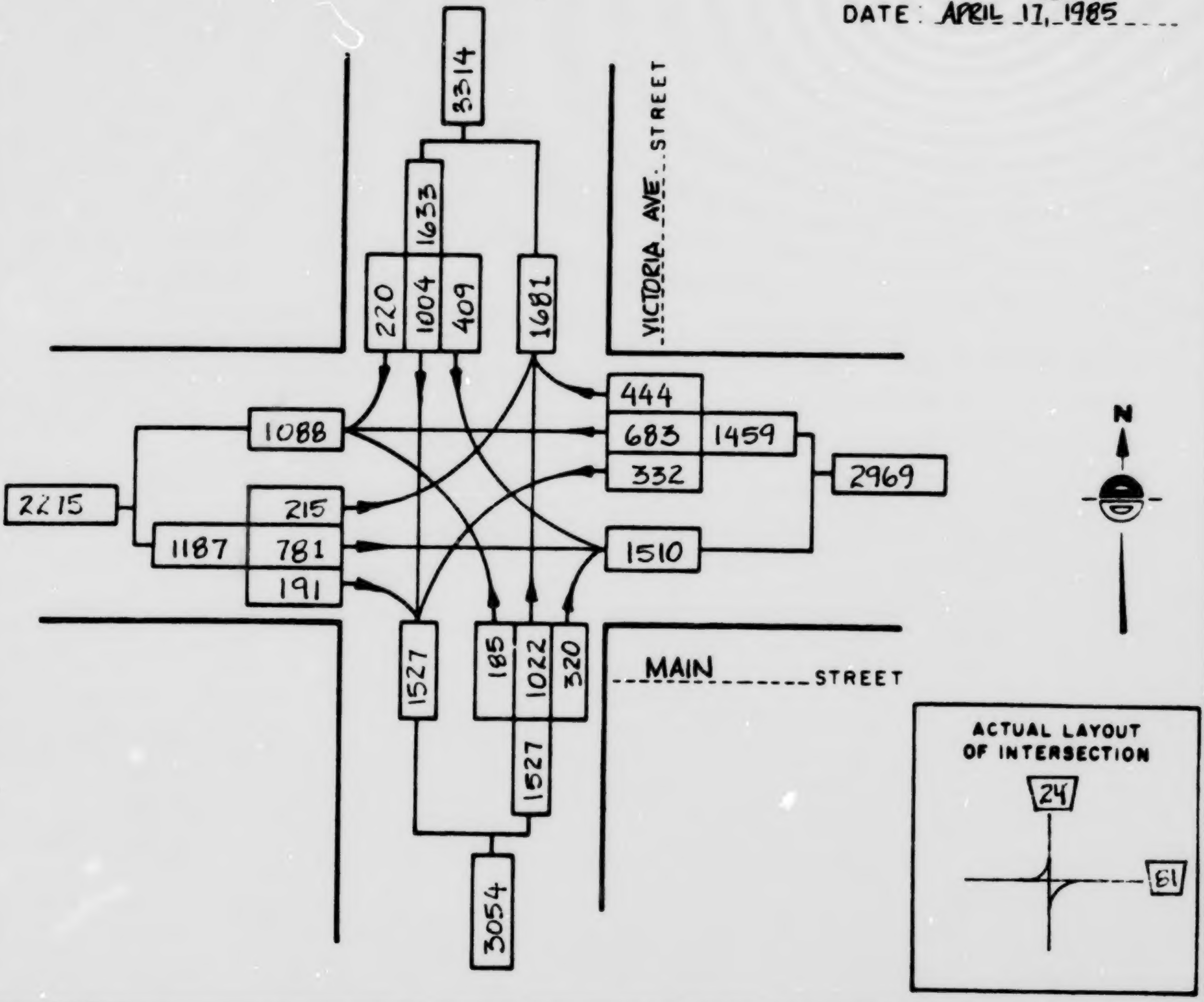
1985 8-HOUR SURVEY

LOCATION VICTORIA AVE. (RR#24) AT MAIN ST. (RR#81)

PERIOD 8:00 - 12:00
13:00 - 17:00

DAY: S M T [✓ W] T F S

DATE: APRIL 17, 1985


3314
1633
220
1004
409
1681
VICTORIA AVE. STREET
1088
444
683
1459
332
2969
2215
215
1187
781
191
1510
1527
185
1022
320
MAIN STREET
1527
3054
N
ACTUAL LAYOUT OF INTERSECTION
24
81

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	409	1004	220	185	1022	320	215	781	191	332	683	444
		SHORT TRUCKS	18	109	11	26	113	23	15	34	22	23	32	24
		LONG TRUCKS	2	146	4	15	112	3	4	14	12	4	13	10
8:00 to 9:00		A.M. PEAK	36	136	29	33	151	40	29	85	19	27	88	46
16:00 to 17:00		P.M. PEAK	87	198	39	26	135	44	30	134	49	68	105	67
	24 HOUR VOLUME													
	A.A.D.T.													

Figure 3.1

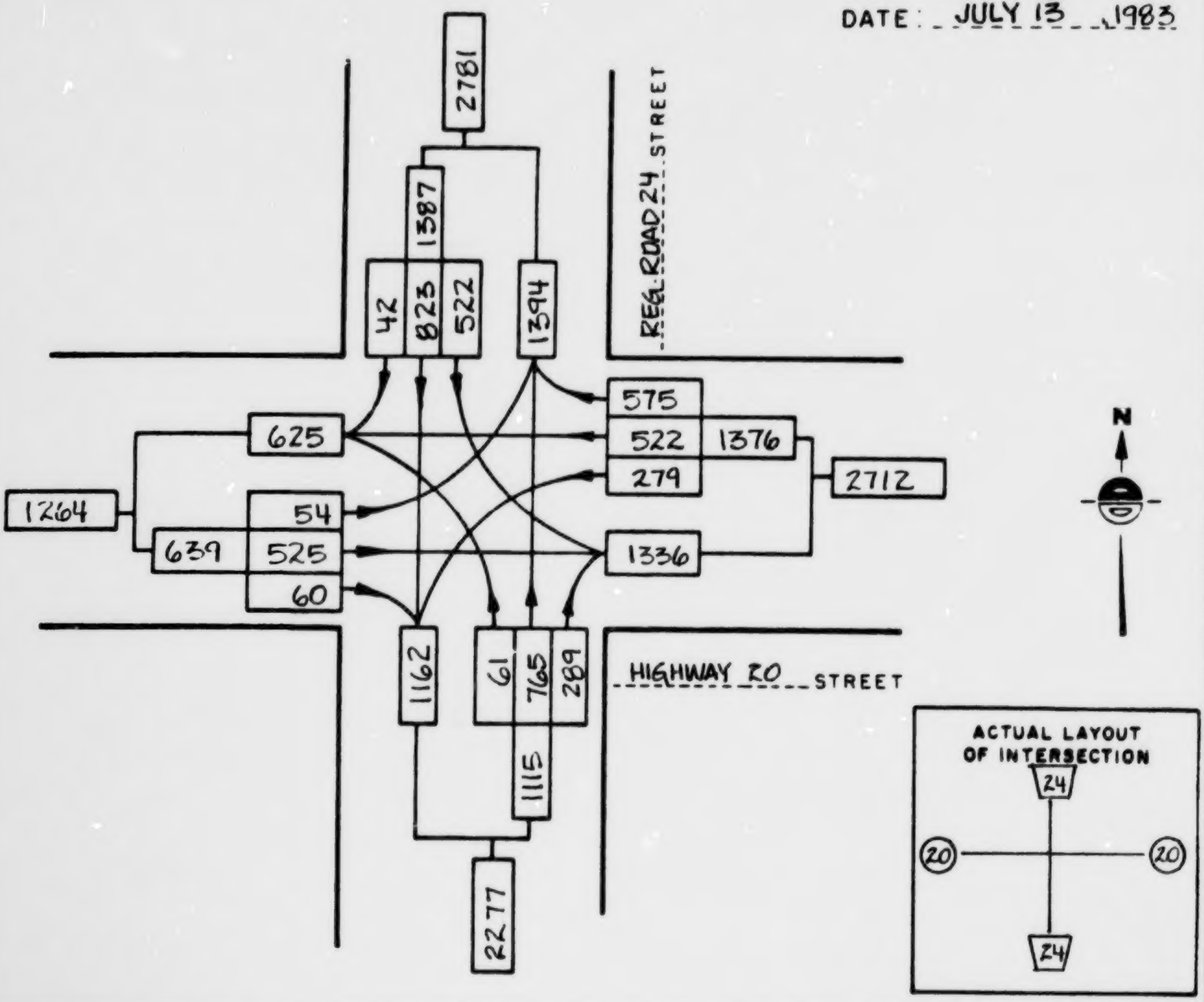
1983 8 HOUR SURVEY

LOCATION REG. ROAD 24 AT HIGHWAY 20

PERIOD 0700 - 1100
1400 - 1800

DAY: S M T [✓ W] T F S

DATE: JULY 13 1983


2781
1387
42
823
522
1394
REG. ROAD 24 STREET
575
522
1376
279
2712
625
1264
54
639
525
60
1336
1162
61
765
289
1115
2277
HIGHWAY 20 STREET
N
ACTUAL LAYOUT OF INTERSECTION
24
20
20
24

TIME & DATE		ITEM	SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	522	823	42	61	765	289	54	525	60	279	522	575
		SHORT TRUCKS	30	43	3	7	43	16	1	31	4	12	21	28
		LONG TRUCKS	43	122	2	3	93	12	1	96	3	11	103	36
10:00 to 11:00		A.M. PEAK	47	102	5	13	83	37	9	96	18	27	58	65
16:30 to 17:30		P.M. PEAK	122	138	7	5	105	38	10	74	6	52	84	70
		24 HOUR VOLUME	1002	1605	80	116	1492	555	103	984	114	536	979	1104
		A.A.D.T.	877	1404	66	97	1306	494	84	822	95	477	817	966

Figure 3.2

The projection of these data to approximate the future operating baseline conditions was limited to the future horizon years of 1995 and 2000. At Highway 20/Regional Road 24, the 1990 baseline conditions were also estimated to represent the background traffic during the construction period. In preparing these estimates of future intersectional turning movements, the highest growth rate occurring on an approach leg that would carry OWMC vehicles was used to simulate a probable 'worst case' condition for analysis. Therefore, at location i), an annual compound growth rate of 5.1% was applied to develop the future baseline forecasts displayed in Figures 3.3 and 3.4. At location ii) an annual compound growth rate of 2.9% was applied to develop the future baseline forecasts as displayed in Figures 3.5, 3.6 and 3.7. These growth rates were extracted from Table 3.1.

4. ANALYSIS OF BASELINE CONDITIONS

The baseline conditions described in the earlier sections were examined to determine any deficiencies which may develop without the OWMC effects. The analysis deals with the traffic operation along the road sections and potentially critical intersections along the local and regional access route, and any possible road improvements which may be warranted due to the background traffic volumes.

Capacity deficiencies and warrant procedures provide guidelines for the need to implement roadway or intersectional improvements. Roadway improvements may include lane widenings or additional lanes which are generally aimed at improving capacity. Intersectional improvements may include provision of auxiliary turning lanes, or modifications to signal cycle length or phase time allocations.

The intersection or roadway level-of-service is commonly used to describe the quality of traffic operations. A description of the different levels-of-service for roadways and intersections is contained in Chapter 2 Methodology. Table 3.5 records the existing and future capacity deficiencies as identified on the municipal roadway appraisal sheets for each road section by future time periods. Similarily, Table 3.6 documents the forcasted levels-of-service for each leg of the two signalized intersections on the access route based upon the existing signal cycle length and phase timings at these locations.

A detailed examination of accident data identifying possible existing accident prone road sections along the access route is contained in Appendix B. The study indicates that the accident experience on the access road as it relates to weather conditions is normal for the Niagara Region; there have been no school bus accidents, and only two farm vehicle incidents during the three year study.

5. CONCLUSIONS

The results of these analyses indicate that the road sections and intersections along the access routes are expected to operate at acceptable levels-of-service (Level "C" or better as described in Table 2.7)) in the horizon years. However, it has been noted that the staff of the Regional Municipality of Niagara forsees the possible need to upgrade the Moyer Road to Niagara Regional Road 73 section of Niagara Regional Road 24 to four lanes within the six to ten-year time frame (1991 to 1995 period) in order to mitigate a possible future capacity deficiency in this area. This potential need relates to the existing gradient at the escarpment crossing and its affect on heavy commercial vehicle operating speeds.

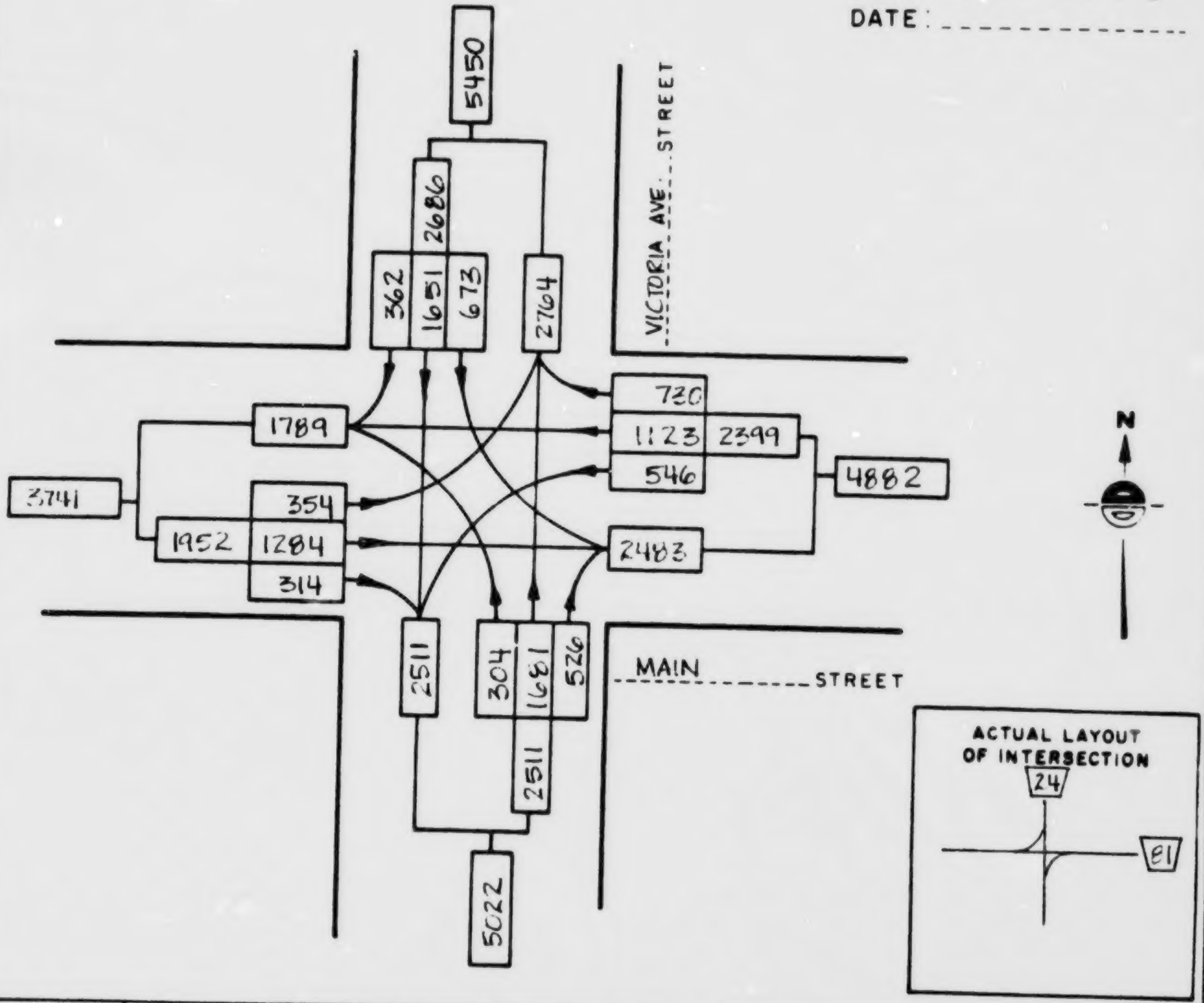
1995 8 HOUR (1985 x 5.1% ANNUAL GROWTH) FORECAST

LOCATION VICTORIA AVE. (RR#24) AT MAIN ST. (RR#81)

PERIOD 0800 – 1200
1300 – 1700

DAY: S M T W T F S

DATE: ______________


5450
2686
362
1651
673
2764
VICTORIA AVE. STREET
730
1123
2399
546
4882
1789
3741
354
1952
1284
314
2483
2511
304
1681
526
MAIN STREET
2511
5022
N
ACTUAL LAYOUT OF INTERSECTION
24
81

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	673	1651	362	304	1681	526	354	1284	314	546	1123	730
		SHORT TRUCKS	30	179	18	43	186	38	25	56	36	38	53	39
		LONG TRUCKS	3	240	7	25	184	5	7	23	20	7	21	16
8:00 to 9:00		A M PEAK	59	224	48	54	248	66	48	140	31	44	145	76
16:00 to 17:00		P M PEAK	143	326	64	43	222	72	49	220	81	112	173	110
	24 HOUR VOLUME													
	A A D T													

Figure 3.3

2000 8 HOUR (1983 x 5.1% ANNUAL GROWTH) FORECAST

LOCATION VICTORIA AVE. (RR #24) AT MAIN ST. (RR #81)

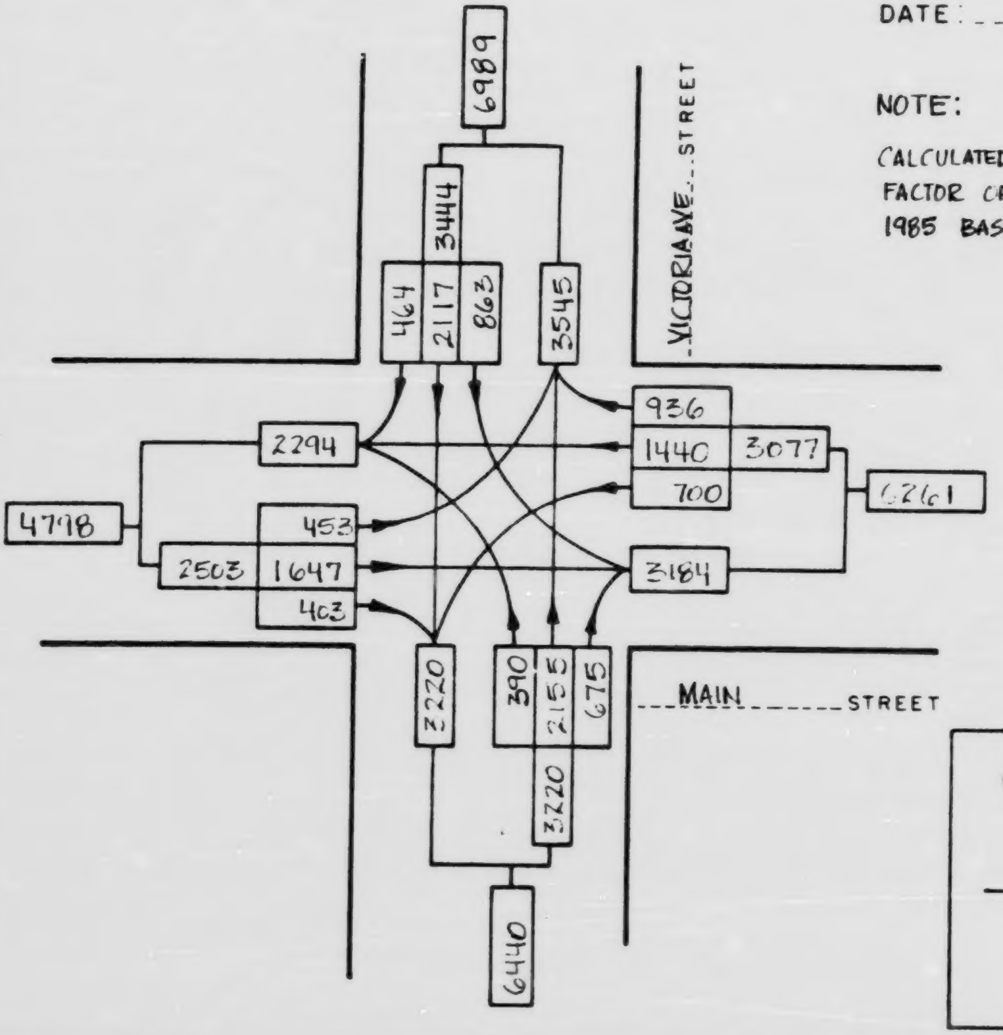
PERIOD 0800 1200
1300 1700

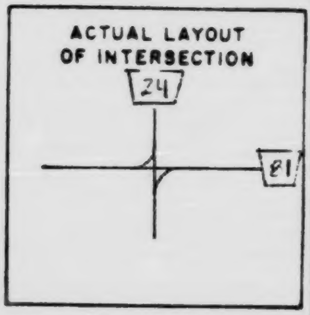
DAY: S M T W T F S

DATE: ______________

NOTE:

CALCULATED USING A GROWTH FACTOR OF 2.11 APPLIED TO 1985 BASELINE DATA.


6989
3444
464
2117
863
3545
VICTORIA AVE. STREET
936
1440
3077
700
6261
2294
4778
453
2503
1647
403
3184
3220
390
2155
675
MAIN STREET
3220
6440


ACTUAL LAYOUT OF INTERSECTION
24
81

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	863	2118	464	390	2156	675	454	1648	403	701	1441	937
		SHORT TRUCKS	38	230	23	55	238	49	32	72	46	49	68	51
		LONG TRUCKS	4	308	8	32	236	6	8	30	25	8	27	21
8:00 to 9:00		A.M. PEAK	76	287	61	70	319	84	61	179	40	57	186	97
16:00 to 17:00		P.M. PEAK	184	418	82	55	285	93	63	283	103	143	222	141
	24 HOUR VOLUME													
	A A D T													

Figure 3.4

1990 8-HOUR (1983 x 2.9% ANNUAL GROWTH) FORECAST

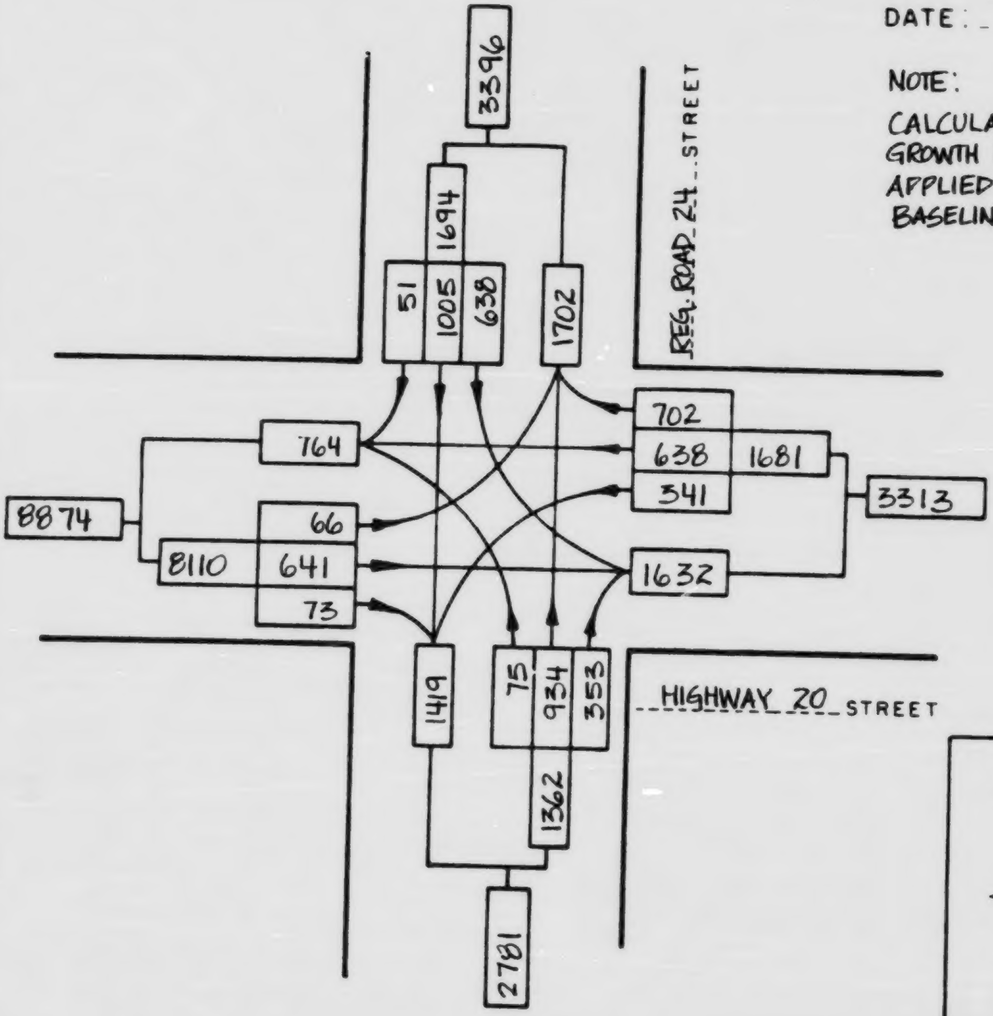
LOCATION REG. ROAD 24 AT HIGHWAY 20

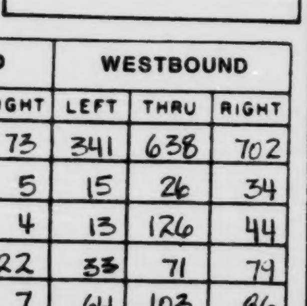
PERIOD 0700 - 1100
1400 - 1800

DAY: S M T W T F S

DATE:

NOTE:
CALCULATED USING A GROWTH FACTOR OF 1.22 APPLIED TO THE 1983 BASELINE DATA.


3396
1694
51
1005
638
1702
REG. ROAD 24 STREET
702
638
341
1681
3313
764
8874
66
8110
641
73
1632
1419
75
934
353
1362
2781
HIGHWAY 20 STREET


ACTUAL LAYOUT OF INTERSECTION
24
20

TIME & DATE		ITEM	SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	638	1005	51	75	934	353	66	641	73	341	638	702
		SHORT TRUCKS	37	52	4	9	53	20	1	38	5	15	26	34
		LONG TRUCKS	53	149	2	4	114	15	1	117	4	13	126	44
1000 to 1100		A.M. PEAK	57	125	6	16	101	45	11	117	22	33	71	79
1630 to 1730		P.M. PEAK	149	169	9	6	128	46	12	90	7	64	103	86
	24 HOUR VOLUME		1224	1961	98	142	1823	678	126	1202	139	655	1196	1349
	A.A.D.T.		1071	1715	81	118	1595	603	103	1004	116	583	998	1180

Figure 3.5

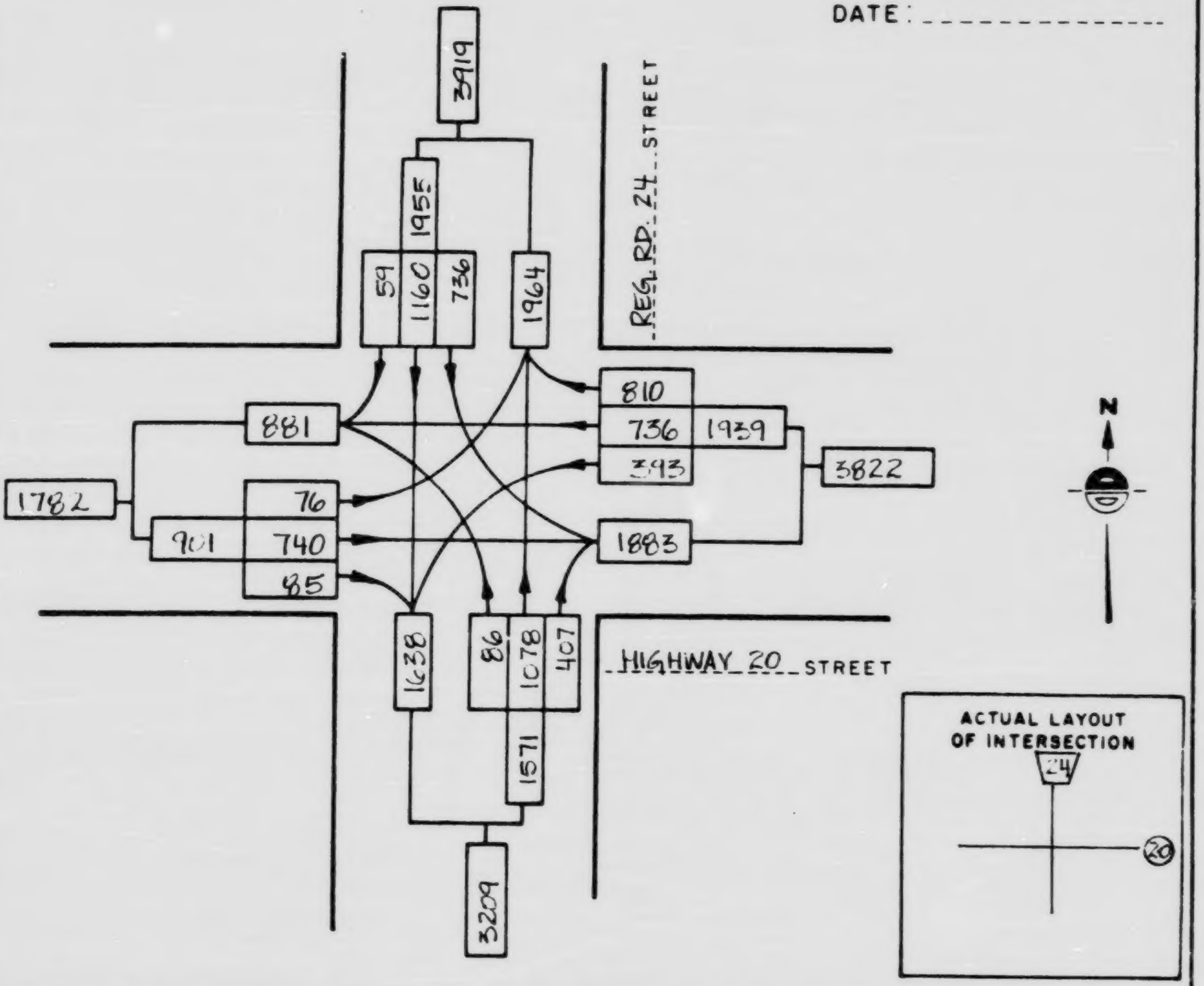
1995 8 HOUR (1983 × 2.9% ANNUAL GROWTH) FORECAST

LOCATION REG. ROAD 24 AT HIGHWAY 20

PERIOD 0700 - 1100
14.00 - 1800

DAY: S M T W T F S

DATE: ______________



3919
1955
59
1160
736
1964
REG. RD. 24 STREET
810
736
1939
393
3822
881
1782
76
901
740
85
1883
1638
86
1078
407
1571
3209
HIGHWAY 20 STREET
N
ACTUAL LAYOUT OF INTERSECTION
24
20

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	736	1160	59	86	1078	407	76	740	85	393	736	810
		SHORT TRUCKS	42	61	4	10	61	23	1	44	6	17	30	39
		LONG TRUCKS	61	172	3	4	131	17	1	135	4	16	145	51
1000 to 11:00		A.M. PEAK	66	144	7	18	117	52	13	135	25	38	82	92
1630 to 1730		P.M. PEAK	172	194	10	7	148	54	14	104	8	73	118	99
	24 HOUR VOLUME		1412	2262	113	163	2103	782	145	1386	161	755	1380	1556
	A.A.D.T.		1236	1979	93	137	1840	696	118	1158	134	672	1151	1361

Figure 3.6

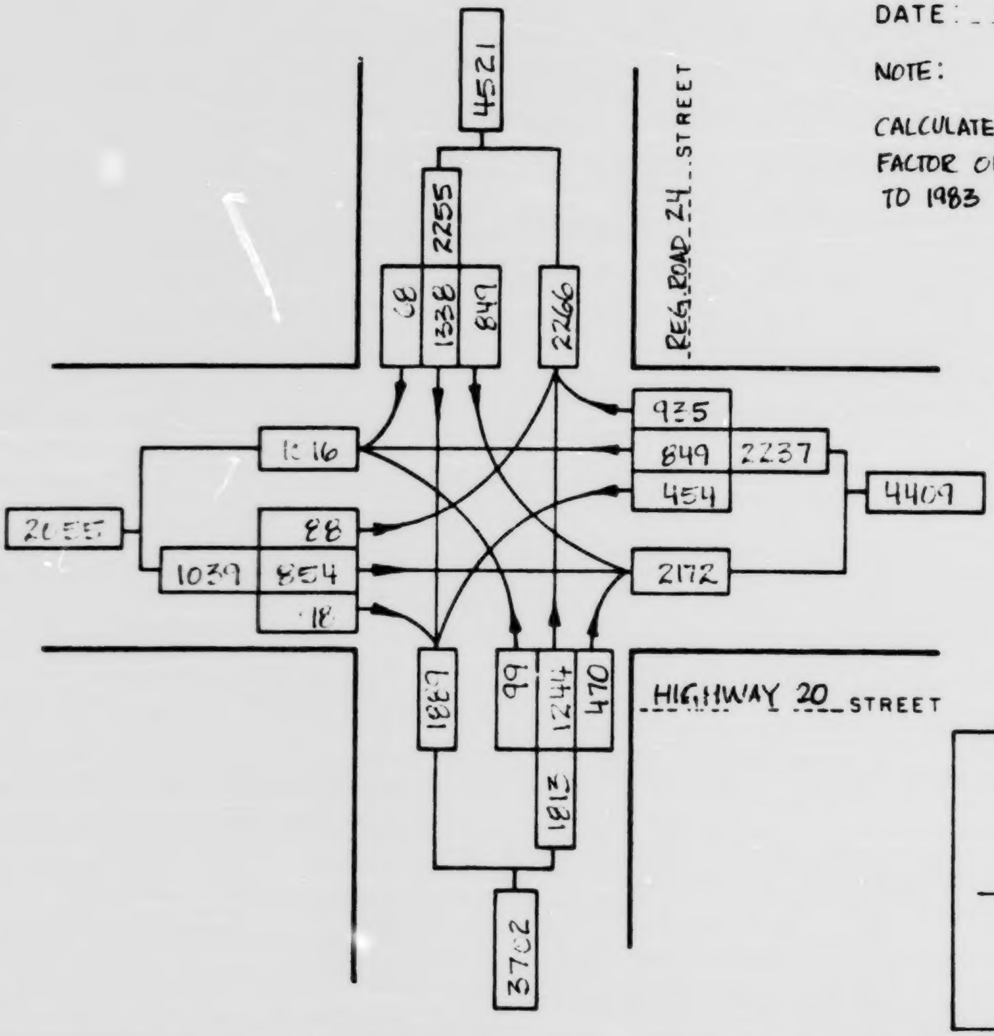
2000 8 HOUR (1983 x 2.9% ANNUAL GROWTH) FORECAST

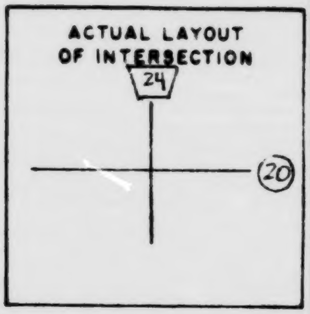
LOCATION REG. ROAD 24 AT HIGHWAY 20

PERIOD 0700 - 1100
1400 - 1800
DAY: S M T W T F S
DATE:

NOTE:

CALCULATED USING A GROWTH FACTOR OF 1.626 APPLIED TO 1983 BASELINE DATA.


4521
2255
68
1338
849
2266
REG. ROAD 24 STREET
935
849
2237
454
4409
1016
2055
88
1039
854
98
2172
1887
99
1244
470
1813
3702
HIGHWAY 20 STREET


ACTUAL LAYOUT OF INTERSECTION

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	849	1338	68	99	1244	470	88	854	98	454	849	935
		SHORT TRUCKS	49	70	5	11	70	26	2	50	7	20	34	46
		LONG TRUCKS	70	198	3	5	151	20	2	156	5	18	167	59
10:00 to 11:00		A.M. PEAK	76	166	8	21	135	60	15	156	29	44	94	106
16:30 to 17:30		P.M. PEAK	198	224	11	8	171	62	16	120	10	85	137	114
	24 HOUR VOLUME		1629	2609	130	189	2426	902	167	1600	185	871	1592	1795
	A A D T		1426	2283	107	158	2123	803	137	1336	154	775	1328	1571

Figure 3.7

TABLE 3.5

OWMC PHASE 4B - TRANSPORTATION

EXISTING AND ESTIMATED FUTURE CAPACITY DEFICIENCIES ON ACCESS ROAD

	CAPACITY DEFICIENCIES IDENTIFIED ON APPRAISAL SHEETS[1]			
LINK DESCRIPTION	EXISTING	1-5 YEARS	6-10 YEARS	COMMENTS[1]
A. Vineland Townline Rd (NRR 24)				
1. QEW to NRR 81	No Los: "C"	No	No	- restrict parking both sides recommended
2. NRR 81 to Moyer	No Los: "A"	No	No	- restrict parking both sides recommended
3. Moyer to NRR 73	No	No	No	- possible need for future 4 lane cross-section
4. NRR 73 to Ninth Ave	No	No	No	
5. Ninth to NRR 216	No	No	No	
6. NRR 216 to Hwy 20	No	No	No	
B. Highway 20				
1. NRR 24 to Schram Rd.	No	No	No	
C. Schram Road				
1. Hwy 20 to Site	No	No	No	

NOTES:

1. Capacity deficiencies and comments were extracted from the appraisal sheets prepared by staff of the Regional Municipality of Niagara.

TABLE 3.6
OWMC PHASE 4B - TRANSPORTATION
EXISTING AND FUTURE INTERSECTION LEVEL-OF-SERVICE

		P.M. PEAK HOUR LEVEL-OF-SERVICE				
INTERSECTION	APPROACH LEG	EXISTING[1]	EST. 1990	EST. 1995	EST. 2000	COMMENTS
Regional Road 24/ Regional Road 81: (70 second signal cycle)	North[2]	A	(3)	B	B	- may warrant left turn lane in future
	South[2]	A	(3)	A	A	
	East	B	(3)	C	C	- left turn lane in future may improve LOS
	West	A	(3)	B	B	
Regional Road 24/ Highway 20: (90 second signal cycle)	North[2]	A	B	B	B	- left turn lane may be warranted in future
	South	A	A	A	A	
	East	A	A	B	B	
	West[2]	A	A	A	A	

NOTES:

1. NRR24/81 existing is based on 1985 data.
   NRR24/Hwy 20 existing is based on 1983 data.
2. These approach legs will be used by OWMC generated traffic.
3. Data was not forecasted or analyzed for assumed construction year of the OWMC facility.

6. RECOMMENDATIONS

The three baseline forecasts (1990, 1995 and 2000) are largely dependent upon information and forecasts made by the Ministry of Transportation and Communications, the Regional Municipality of Niagara and the Township of West Lincoln in their respective Roads Needs Studies carried out in the years 1984 or 1985. As such studies are repeated every five years, it is recommended that the updates occurring in 1989 and 1990 be reviewed to discern any changes that have occurred that may modify expected future baseline conditions. Specific items to be addressed in the review include:

- actual AADT volumes in the years 1989-90;
- actual annual volume growth rates;
- modifications to the ten-year growth forecasts;
- actual medium and heavy truck volume percentages;
- existing and forecasts of roadway and intersection levels-of-service; and
- new deficiencies that may be identified in the then future 0-5 year or 6-10 year time periods.

It is further recommended that the road safety statistics developed during these future years be reviewed to confirm and/or modify the all-vehicle accident involvement rate statistics which are presented herein and applied for purposes of future risk prediction, and to monitor traffic safety at specific locations identified in Appendix B.

CHAPTER 4

RISK AND IMPACT ASSESSMENT

1. INTRODUCTION

The report, M.M. Dillon Limited, October 1985, Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Transportation, presented comparative information on the risks and impacts assessment of all candidate sites including the Preferred Site. During the Phase 4B assessment of the Preferred Site more detailed transportation factors and updated information have been applied which necessitates an updating of the results of the earlier Phase 4A analyses. The results of the updated transportation predictions are presented and discussed within this chapter.

The transportation consultant was also responsible for developing information which was then applied by other consultants with responsibilities for other disciplines. Consequently, reference should be made to these individual reports as well as, the synthesis report, M.M. Dillon Limited, 1987, OWMC Environment Assessment - Site Assessment Volume.

1.1 Purpose and Scope

This chapter is intended to provide the results of the transportation risk and impact analyses based on the updated information and factors developed during the site assessment phase of the OWMC facility design process. During this phase modified or new facility characteristics, and improvements to baseline information, provide new inputs to factors thus modifying the results of the earlier predictions made during Phase 4A.

The scope of the analysis focuses on the site vicinity, and local and regional access system. This is a site specific analysis, therefore no attempt is made to address potential changes in transportation risks or impacts on the province-wide access system. These were addressed during the comparative evaluation of candidate sites in Phase 4A, and have not changed significantly.

The current analysis was undertaken to address the effects of facility operations based upon an operating plant having an annual throughput capacity of 150 000 t/a of special wastes. However, since the initial plant design would be capable of expansion to a 300 000 t/a throughput, the transportation-related consequences of the risks and impacts associated with ultimate capacity operation are also addressed.

1.2 Overview

A number of data input modifications were made during site assessment and are discussed in Chapter 2. These produce changes in the transportation risk and impact assessment results, and are discussed within various sections of this chapter. The more significant changes in operations or baseline conditions which are addressed include the following:

- change in treatment plant size;
- specific analysis of site development and operating time horizons:

- identification of additional transport requirements for landfill area clay disposal and importation of granular materials;
- consideration of site construction impacts (materials, equipment, work force, and export of clay);
- consideration of employee transport requirements;
- change in site access location from Highway 20 to Schram Road;
- change in background traffic forecasts and percent of medium and heavy trucks;
- refinements to baseline accident frequency and accident involvement rates.

The above noted changes and modifications were then applied to produce a new risk and impact assessment for the West Lincoln site.

The engineering consultant (Monenco Limited) also developed four plant operating scenarios which affects the material transport requirements of plant operations. The base case for risk and impact assessment used the 'typical operations' scenario. To assess the effects of the 'high solidified' scenario a sensitivity analysis approach was applied to demonstrate the variance in risks or impacts from the 'typical' scenario for both 150 000 and 300 000 tonnes per annum of special wastes.

2. FACTOR IDENTIFICATION

2.1 Selection of Phase 4B Factors

A total of four factors and eight indicators were developed and applied by the transportation consultant in Phase 4A for purposes of the comparative evaluation of candidate sites. In addition, impact and cost inputs were developed and provided to other consultants for application in the development of their factors/indicators. Two of the Phase 4A transportation factors and two indicators were applied to the province-wide access system which is outside the scope of the site specific assessment. The two remaining factors and six indicators were reviewed as to their suitability for application in the Phase 4B analysis of risks and impacts.

One factor involving two indicators was selected for the risk analysis:

° Transportation Risk Due to Accident Involvements: Risk to human health on the local and regional access roads due to accidents involving OWMC generated transport;

- frequency of fatal accident involvement,
- frequency of personal injury accident involvement.

Within the risk factor group a modified factor was also developed using two indicators:

° Transportation Spill Frequency: Potential risk to human and environmental receptors along the local and regional access roads due to spills resulting from the transport of special wastes, and additives and reagents;

- frequency of motor vehicle accident-related spills,
- frequency of non-motor vehicle accident-related spills.

Two new factors were also developed for Phase 4B impact assessment due to the increased level of detail applied in this phase. These are impact factors which assess the effects of OWMC generated transport on the local and regional access route. Within the first factor, two indicators were developed which deal with impacts on road links and at the two existing signalized intersections, as follows:

° Transportation Impacts on the Local and Regional Access Route resulting from the increase in OWMC generated traffic volumes;

  - effects of OWMC traffic volume surcharge on access road links,
  - effects of OWMC traffic volume surcharge at signalized intersections.

The second new factor assesses the change in impacts in terms of accident involvements as a result of OWMC generated traffic volumes on the access route:

° Transportation Impact on the Local and Regional Access Route resulting from the increase in OWMC transport accident involvements;

  - change in annual accident involvements due to additional transport movements generated by OWMC operations.

The two new factors developed for Phase 4B assessment replace other factors and indicators that were developed and applied during Phase 4A Site Selection. This is in keeping with the purpose of the site assessment phase involving a greater level of detail of analysis for the preferred site. Detailed Factor Sheets for the factors and indicators applied in Phase 4B are contained in Appendix C.

2.2 Rationale for Modification of Phase 4A Factors

As noted, the scope of the site assessment analysis precluded the use and application of factors relating to the province-wide access systems (from the QEW/Niagara Regional Road 24 interchange back to the individual waste generating source areas). The potential risks associated with this component of the overall system were identified in the prior Phase 4A analysis. It is also recognized that these potential risks would likely exist in any event irrespective of the OWMC site location. Hazardous wastes and the much larger quantities of dangerous commodities move daily over the province-wide system and associated risks/ impacts appear to be acceptable.

The surcharge of OWMC generated traffic movements anticipated to occur over the province-wide system would represent an extremely small addition to existing and/or future traffic volumes on the system. The most heavily loaded links would be on the QEW between the Niagara Regional Road 24 interchange and the Highway 403 interchange in Burlington. Current annual average daily traffic volumes along this section of the QEW range from 40,000 to 64,000 vehicles. The added OWMC traffic would therefore be well below 1% of existing volume levels.

Transportation of special wastes and certain of the process materials on the local and regional access system is another matter. The preferred access route becomes the location where most of the transport of these materials would occur. Consequently, it is important to identify the added risks and impacts associated with these movements on the preferred route so that mitigative measures may be considered where appropriate.

The transportation consultant has thus selected factors and indicators that assess the risk/impacts directly and/or provide a forecast of event frequency that may be applied in a risk pathway analysis. These factors/indicators were identified in the prior section and are developed later in this chapter.

2.3 Factor Inputs to Others

This section summarizes the types of information and data prepared by the transportation consultant which were provided to other OWMC consultants as an input to their analyses and reports. Since much of this information was also used for purposes of the transportation risk and impact analysis, this information is also recorded elsewhere within the report or appendices:

- Forecasts of background traffic volumes on the local and regional access system; (Provided to S.S. Wilson & Associates)
- Forecasts of OWMC generated traffic volumes for future time periods on the access system; (Provided to S.S. Wilson & Associates)
- Spill frequency predictions by type on the local and regional access route by road link; (Provided to Environ Corp.)
- Transportation cost estimates for material transport along the total system at two facility operating levels; (Provided to Monenco Ltd., and D.P.A. Group Incorporated).

- Cost estimates for improvement of the Schram Road/Highway 20/ Silverdale Road intersection; (Provided to Monenco Ltd.)

- Cost estimates for upgrading Schram Road and provision of site entrances. (Provided to Monenco Ltd.)

3. FORECAST OF OWMC TRANSPORT DEMANDS

3.1 Transport Requirements for Site Construction - 1990

The basis and rationale for selection of December 1990 as the maximum transportation impact period for OWMC site construction was discussed in Chapter 2, sub-section 3.1.5. During this month the highest total transport demand occurs in terms of workforce, and equipment and material movements to and from the West Lincoln site.

The forecast of workforce requirements, in and outbound movements of equipment and material trucking and export of clay materials, was developed by the engineering consultant (Monenco Limited). To produce the forecast of total vehicle movements to and from the site during the December 1990 construction month, it was necessary to develop a trip distribution pattern. This distribution produced an assignment of trips to road links used to assess the design requirements for the Schram Road intersection with Highway 20.

3.1.1 Construction workforce and materials traffic distribution

The distribution of workforce and material transport movements was undertaken using a simplified gravity model.

For workforce trip distribution it was assumed that the potential traffic shed would include the entire Regional Municipality of Niagara, Regional Municipality of Hamilton-Wentworth and the easterly portion of the Regional Municipality of Haldimand-Norfolk. It was believed that contractor workforces involving skilled, semi-skilled and unskilled labor could have their home-base within the described area. The distribution was then undertaken using the published 1985 population for each second tier municipality divided by the square of the airline distance from the assumed centroid of each municipality to the West Lincoln site. The calculated number of workforce trips from each of these municipalities were then assigned to an assumed best route to arrive or depart the West Lincoln site. The resulting distribution pattern at the site is summarized below:

- From or to the west on Highway 20 = 45%
- From or to the east on Highway 20 = 55%
- From or to the north on NRR24 = 20%

The resulting number of workforce trips assigned to the local and regional access route is displayed in Table 4.1.

Material deliveries were divided into two categories representing items which would likely be supplied from sources within the Niagara Region alone, and those that may be supplied from sources within Niagara Region and Hamilton-Wentworth. The materials likely to be supplied from within Niagara Region would include the following: concrete, asphalt, and granular. Those likely to be supplied from both the Niagara Region and Hamilton-Wentworth Region are as follows: major equipment, pipe, structural steel, and miscellaneous items. Trips were distributed on the basis of population, and were not considered sensitive to distance. Based on the described methodology, the following distribution patterns were developed for material deliveries to the site:

- From or to the west on Highway 20 = 60%
- From or to the east on Highway 20 = 40%
- From or to the north on NRR 24 = 10%

The number of truck trips involving material or equipment deliveries is also displayed in Table 4.1.

3.1.2 Clay Exports Traffic Distribution During Construction

The engineering consultant (Monenco) has identified a need to export quantities of clay materials off-site during the construction period. It is expected that this clay material will be hauled off-site at the same rate as it is generated. The duration of the excavation and haulage of these materials has been estimated as follows:

- Central Operating Area Excavations: 10 months
- Landfill Development Excavations: 10 months
- Initial Landfill Excavation of Area 1: 15 months.

The maximum impact of these movements will occur during the 1990 construction season and will correspond to the December 1990 period when the maximum workforce and material deliveries occur.

The destination of these materials cannot be confirmed at this time. However, the 'worst-case' assumption that this material would be hauled to Vineland Quarries at the intersection of Niagara Regional Roads 73 and 24 has been applied to analyze the maximum impact on the access road. The number of trucks hauling clay during the peak construction month is shown in Table 4.1.

3.1.3 Construction traffic assignment

The forecasted assignment of site construction generated trips from and to the West Lincoln site are displayed in Table 4.1. These are the number of workday trips expected to occur during the most intensive month of construction activity and anticipated to occur in December 1990. The volumes noted are additive to the background (non-OWMC) traffic forecasts.

3.2 Transport Requirements for Year Five Operations - 1995

Year five of the OWMC facility operation has been defined as the year in which the treatment plant would be operating at the initial plant design throughput rate of 150 000 t/a of special wastes. At this operating level there are specific transportation requirements which are developed in this section as inputs to the site assessment risk and impact analysis. These include the trucking of materials and work trip forecasts for:

- special wastes
- process additives and reagents
- granular materials and surplus excavated material, and
- employee work trips

As risks and impacts associated with these four transport requirements differ, it is necessary to quantify the transport requirements for each of these items.

The following sub-sections present the results of the analysis undertaken to forecast the individual transport requirements at the 150 000 t/a operating level.

3.2.1 Special waste transport

During the Phase 4A transportation analysis, the annual trucking requirements for the transport of 300 000 t/a of special waste was

TABLE 4.1

OWMC PHASE 4B - TRANSPORTATION

TWO-WAY DAILY OWMC GENERATED TRAFFIC VOLUMES ASSIGNED TO THE LOCAL AND REGIONAL ACCESS ROUTE FOR YEAR 1990: SITE CONSTRUCTION (PEAK MONTH)

	WORK DAY TWO-WAY TRAFFIC VOLUMES				
	Medium and Heavy Trucks				
Access Route Link Description	Clay Exports	Material and Equipment	Total	Passenger Vehicles	Total All Vehicles
A. Vineland Townline Road (NRR 24)					
1. QEW to NRR 81	0	2	2	198	200
2. NRR 81 to Moyer	0	2	2	198	200
3. Moyer to NRR 73	0	2	2	198	200
4. NRR 73 to Ninth Ave.	954	2	956	198	1 154
5. Ninth Ave. to NRR 216	954	2	956	198	1 154
6. NRR 216 to Hwy 20	954	2	956	198	1 154
B. Highway 20					
1. NRR 24 to Schram Rd.	954	16	970	542	1 512
2. Schram Rd[1] to Bismarck	0	6	6	444	450
C. Schram Road					
1. Hwy 20 to site	954	22	976	986	1 962

NOTES: 1. Access road link B.2. is not a part of the defined local and regional access route; however volume assignment to this link is displayed in that this traffic surcharge is an input to the site noise impact assessment and design of the Highway 20/Schram Road intersection.

prepared. This is presented in the reports, M.M. Dillon Limited, October 1985, Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Transportation, and the Technical Appendices. As only a minor change was identified during Phase 4B, in relation to special waste transport, the prediction of transport needs at the 150 000 t/a operating level was accomplished by halving the vehicle movements that were calculated for the 300 000 t/a operating level.

The minor change in special waste transport concerned an assumed increase in the receipt of larger quantities of drummed waste and therefore a reduction in the quantities of pumpable and non-pumpable special wastes that were assumed to be hauled in different vehicle types and load sizes. To compensate for this modified assumption (see Chapter 2 sub-sections 3.1.2 and 3.1.6) a larger drummed-wastes vehicle size was then assumed. The result of this combination of modified assumptions is that no change occurs in the annual trucking requirements for special wastes.

The Phase 4A transportation document (Dillon 1985) also provides the basic information from which the annual forecast of special waste movements on the local and regional access road links was developed for the 150 000 t/a operating level. As the special waste trucking requirements and sources remain unchanged, the link assignment of trips is exactly one half of those developed for the 300 000 t/a operating level.

One change was necessary to the link assignments because of the decision to access the West Lincoln facility site from Schram Road. This change from the Phase 4A assumption of a site entrance directly from Highway 20 (along the north site boundary) occurred during the Phase 4B site assessment investigations. The rationale and considerations involved are discussed in Section 4 of this chapter.

The resulting forecast of daily special waste transport at the 150 000 t/a operating level is recorded in Table 4.2. The daily movements as recorded, were developed from the forecast of annual movements which was divided by the assumed 250 plant operating days per annum. While certain of the treatment plant operations will occur seven days per week, waste transport movements will only be received on working weekdays.

3.2.2 Additives and reagents transport

The process material requirements and load sizes changed somewhat from those used in the Phase 4A analysis. These refinements, provided by the engineering consultant (Monenco Limited), were discussed in Chapter 2, sub-section 3.1.1. These new values were used to update the transportation model and two new source locations were introduced for new materials. The model was then used to produce an assignment of truck shipments of the process materials including the production of travel time and distances from all source locations to the West Lincoln site. The specific output required was the annual number of additive and reagent transport movements on the local and regional access system to the site. The resulting annual forecasts of transport of process materials at the 150 000 t/a operating level were then converted to daily movements based on 250 plant operating days. The results are also presented in Table 4.2.

3.2.3 Clay and granular material transport

During Phase 4B site assessment the engineering consultant (Monenco Limited) provided quantity estimates for granular materials to be procured and used within the landfill operations area and for earth removal (mainly clay) to be disposed of off-site. The assumptions applied with respect to this additional material transport were discussed in Chapter 2, subsections 3.1.4 and 3.2.2. Based on these, the transportation consultant calculated the annual transport requirements for the movement of these materials and assigned these movements to the links of the local and regional access road system. In that a maximum impact assumption was used, all movements occur on the preferred access routes.

The results of this component of the analysis are displayed in Table 4.2 within the clay and granular column of the table. The number of daily trucks recorded therein represents the maximum generation and was calculated from the forecasted annual movement requirements for year five corresponding to the 150 000 t/a operating level. This was accomplished by dividing the year five annual clay values by 210 normal work days (ten months) during which material shipments are expected to occur, and the annual granular values by 250 working days per year.

3.2.4 Employee vehicle trips

The normal workday employment levels and shift size assumptions taken were set out in Chapter 2 sub-sections 3.1.6 and 3.2.7. These form the basic inputs to the development of employee vehicle trip forecasts at the 150 000 t/a operating level. As was noted, these were then increased slightly to reflect the additional employee trips that may be expected to occur within their individual work periods.

As a part of this analysis an assignment of work trips to the access route links was necessary for intersection design and site impact assessment. No forecasts of employee home-base were available which would provide information on direction of approach and departure for these trips. Consequently, it was necessary to assume a trip distribution at the intersection of Schram Road and Highway 20. The assumed distribution was that 55% of all employee

TABLE 4.2
OWMC PHASE 4B - TRANSPORTATION
TWO-WAY DAILY OWMC GENERATED TRAFFIC VOLUMES ASSIGNED TO THE LOCAL AND REGIONAL ACCESS ROUTE
FOR YEAR 1995: OPERATING LEVEL 150 000 t/a

	OPERATING WEEKDAY TWO-WAY TRAFFIC VOLUMES					
	MEDIUM AND HEAVY TRUCKS CARRYING[1]					
Access Route Link Description	Special Waste	Additives & Reagents	Sub Total	Clay and Granular	Total Trucks	Employee Vehicles[2]
A. Vineland Town-line Road (NRR 24)						
1. QEW to NRR 81	54	10	64	0	64	0
2. NRR 81 to Moyer	54	10	64	0	64	0
3. Moyer to NRR 73	54	10	64	0	64	0
4. NRR 73 to Ninth Ave.	54	10	64	78	142	0
5. Ninth Ave. to NRR 216	54	10	64	78	142	0
6. NRR 216 to Hwy 20	54	10	64	78	142	0
B. Highway 20						
1. NRR 24 to Schram Rd.	80	10	90	78	168	200
2. Schram Rd. to Bismarck[3]	0	0	0	0	0	164
C. Schram Road						
1. Hwy 20 to site	80	10	90	78	168	364

NOTES:

1. The medium and heavy truck operating weekday volumes displayed are rounded values calculated by dividing the total annual volume by 250 working days during which these movements would occur (clay movements based on 210 working days/year and granular movements on 250 days/year).

2. Employee trips are based on normal workdays when maximum employment occurs and is concurrent with material movements.

3. Access road link B.2. is not a part of the defined local and regional access route; however volume assignment to this link is displayed in that this traffic surcharge is an input to the site noise impact assessment and design of the Highway 20/Schram Road intersection.

trips would be to or from the east of the intersection and 45% to or from the west. No distribution was made to other available roads within the site vicinity, e.g. Vaughan Road which may be used by employees residing in the Wellandport area.

The weekday employee trip assignments to the road links is as set out in the last column of Table 4.2. The vehicle trips noted for employees, are those occurring during a 24-hour normal workday. Trips occurring on weekends or holidays would be substantially less as staffing would be at a much lower level.

It will be noted that employee trips are only assigned to three links of the access route system. Because of the proximity of Schram Road and the east and west Highway 20 links to the site, coupled with the low rate of growth forecasted by the Ministry of Transportation and Communications and the Township of West Lincoln on their respective roadways, it seemed reasonable to assume these site generated movements as surcharges to background traffic movements. However, no further distribution of employee trips was made beyond the ends of these links for the following reasons:

° At the east end of the NRR 24 to Schram oad link three directional choices occur:

  - continue east on Highway 20
  - turn right onto NRR 24 south, or
  - turn left onto NRR 24 north

° At the west end of the Schram Road to Bismarck link three directional choices occur:

  - continue west on NRR 65
  - turn right to continue on Highway 20, or
  - turn left onto NRR 27 south

The many choices and opportunities for employee traffic dispersion and the relatively high annual growth rates used on NRR24 confirms the inconsequential effects of employee trips beyond Highway 20.

An additional important factor to be considered is the effect of work trip spreading due to the nature of OWMC facility operations. The a.m. starting times for day shift work groups ranges from 7:00 to 9:00 a.m., while the p.m. departure time spread varies from 4:00 to 6:00 p.m.. This further diminishes the impact of peak period employee trip movements beyond the three links.

Further information on the potential impact of this conclusion is dealt with in a subsequent section of this chapter.

3.3 Transport Requirements for Year Ten Operations - 2000

Year ten operations of the OWMC facility is define as the year in which an annual throughput rate of 300 000 t/a of special wastes would be processed. This in essence requires a doubling of the plant treatment capacity. This level of operation approximately doubles the transport requirements for delivery of special wastes, additives and reagents, and granular material, as well as the amount of clay materials to be exported. The employment component increases by about 30%.

The methods and procedures employed in developing the year 2000 OWMC transport forecasts are fundamentally the same as described in Section 3.2 of this chapter. Therefore these will not be repeated here.

Weekday two-way traffic volume forecasts for the three material categories and site employment are presented in Table 4.3.

TABLE 4.3
OWMC PHASE 4A - TRANSPORTATION
TWO-WAY DAILY OWMC GENERATED TRAFFIC VOLUMES ASSIGNED TO THE LOCAL AND REGIONAL ACCESS ROUTE FOR YEAR 2000: OPERATING LEVEL 300 000 t/a

	OPERATING WEEKDAY TWO-WAY TRAFFIC VOLUMES					
	MEDIUM AND HEAVY TRUCKS CARRYING[1]					
ACCESS ROUTE LINK DESCRIPTION	SPECIAL WASTE	ADDITIVES & REAGENTS	SUB TOTAL	CLAY AND GRANULAR	TOTAL TRUCKS	EMPLOYEE VEHICLES[2]
A. Vineland Townline Road (NRR 24)						
1. QEW to NRR 81	106	18	124	0	124	0
2. NRR 81 to Moyer	106	18	124	0	124	0
3. Moyer to NRR 73	106	18	124	0	124	0
4. NRR 73 to Ninth Ave.	106	18	124	152	276	0
5. Ninth Ave. to NRR 216	106	18	124	152	276	0
6. NRR 216 to Hwy 20	106	18	124	152	276	0
B. Highway 20						
1. NRR 24 to Schram Rd.	158	18	176	152	328	266
2. Schram Rd. to Bismarck[3]	0	0	0	0	0	216
C. Schram Road						
1. Hwy 20 to site	158	18	176	152	328	482

NOTES:

1. The medium and heavy truck operating weekday volumes displayed are rounded values calculated by dividing the total annual volume by 250 working days during which these movements would occur (clay movements based on 210 working days/year and granular movements on 250 days/year).

2. Employee trips are based on normal workdays when maximum employment occurs and is concurrent with material movements.

3. Access road link B.2. is not a part of the defined local and regional access route; however volume assignment to this link is displayed in that this traffic surcharge is an input to the site noise impact assessment and design of the Highway 20/Schram Road intersection.

The results of this analysis as well as that presented in Tables 4.1 and 4.2 are applied in Section 6 of this chapter.

4. DESIGN REQUIREMENTS FOR SITE ACCESS SYSTEM

4.1 Site Access Requirements

During Phase 4B the facility operational layout of the West Lincoln site was refined leading to revisions in the site access system needs. This new information raised a number of questions about the assumption used in Phase 4A wherein primary site access was proposed to occur from Highway 20 which forms the north boundary of the site. A need was therefore recognized to undertake an operational and impact assessment of the available site access options.

Information on access route selection is also contained in the report, M.M. Dillon Limited, 1987, OWMC Environmental Assessment - Site Assessment Volume.

The conclusions and recommendations developed from this study confirmed that:

- Primary access for all site activities should occur from Schram Road, the easterly boundary roadway flanking the site, and

- Emergency access (fire, police, ambulance, etc.) should be provided along the north side boundary from Highway 20.

Schram Road is classified as a 'local' road and is under the jurisdiction of the Township of West Lincoln. It has a total length of some 1425 m extending from its intersection with Highway 20 in the north to the Vaughan Road intersection in the south. This length is adequate to provide multiple opportunities for accessing the various OWMC operating areas which have been defined by the engineering consultant (Monenco Limited). Four individual entrances to the site are proposed serving the following functions:

a) The main entrance to the treatment plant facility is proposed to be located some 905 m south on Schram Road from the Highway 20 intersection. This entrance is proposed to serve all truck transport movements associated with the receipt of special wastes, and process additives and reagents.

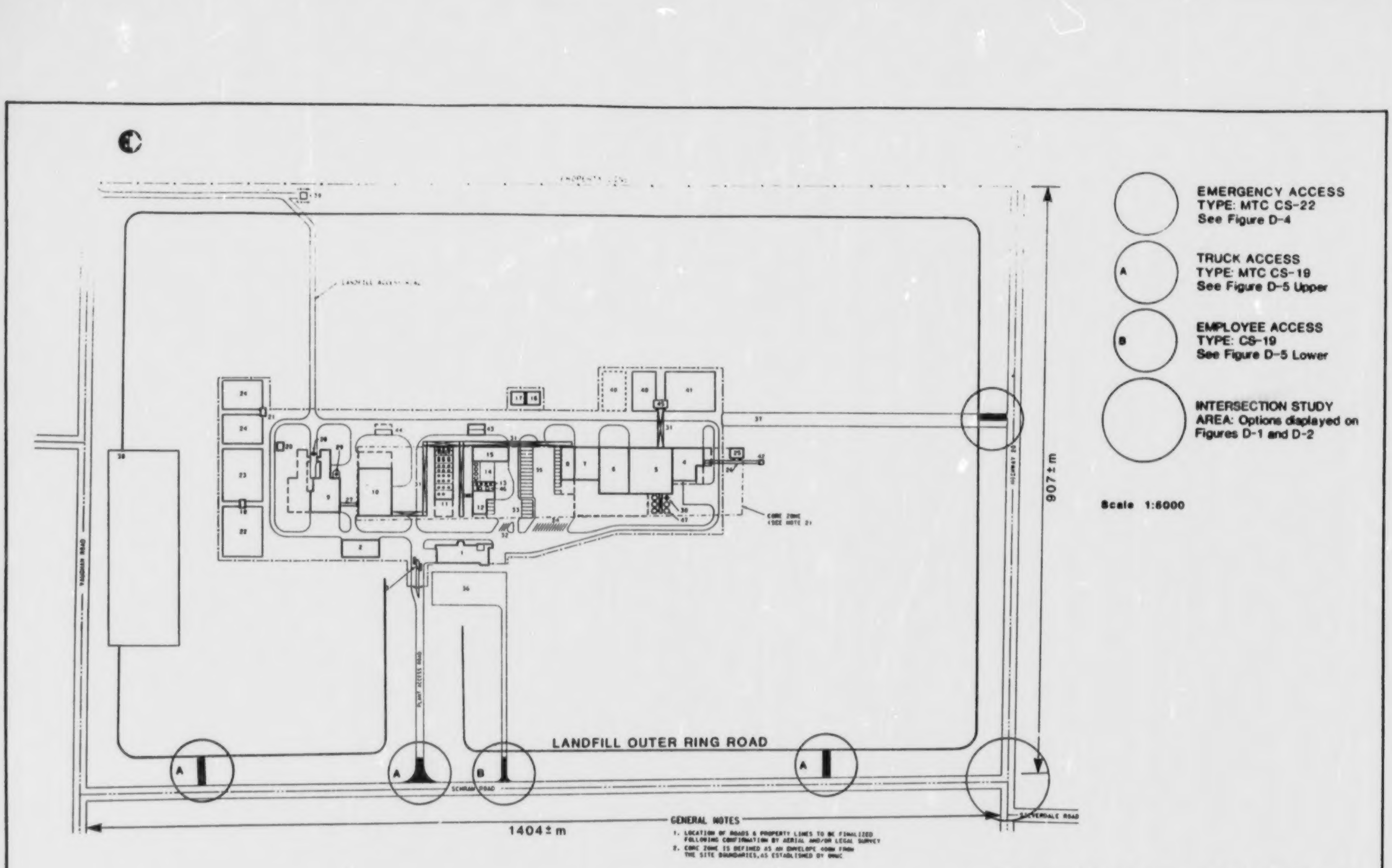
b) An employee/visitor entrance to the site administration building and parking lot is proposed to be located along Schram Road some 775 m south of the Highway 20 intersection. This entrance would be used by all employees working on-site, and visitors to the facility.

c) Two landfill area service entrances are also proposed from Schram Road, although only one of these would be active at any given time. These entrances would connect with the outer ring road, surrounding the landfill area and located in the perimeter buffer zone. The entrance used on any operating day would be the one located in closest proximity to the active landfill area. Delivery trucks supplying granular materials to the landfill or transporting surplus earth and clay materials from the active landfill area to an off-site disposal area(s) would use this entrance.

Figure 4.1 presents information on the proposed location of the four site entrances from Schram Road. Only the location of the operating plant and employee entrances are considered to be reasonably well fixed at this time. Some flexibility in locating the landfill entrances remains. Also shown on this figure is the proposed location of the emergency entrance to the site from Highway 20. This would be a gated entrance which would be normally closed except for use by emergency vehicles. Another entrance is also shown in the southwest corner of the site. This is an existing entrance to the meteorological/air monitoring station which is accessed from Vaughan Road.

4.2 Schram Road/Highway 20 Intersection Improvements

The proposed use of Schram Road as the location for all operating site entrances, necessitates the identification of improvements required at the Highway 20/Schram Road intersection. The existing intersection location is constrained by the tee intersection formed by Silverdale Road and Highway 20 which is located 57 m east of the Schram Road/Highway 20 intersection. This poses an adverse operating situation in that eastbound left turns to the north (at Silverdale) and westbound left turns to the south (at Schram) are in conflict. The improvement of Highway 20 to provide an exclusive westbound left turn lane at the Schram Road intersection would intensify this conflict and would heighten the potential for head-on collisions. Avoidance of this conflict would involve one of three possible solutions:


PROPERTY LINE
LANDFILL ACCESS ROAD
VAUGHAN ROAD
HIGHWAY 20
SCHRAM ROAD
PLANT ACCESS ROAD
SILVERDALE ROAD
LANDFILL OUTER RING ROAD
CORE ZONE (SEE NOTE 2)
907± m
1404± m
A
B
EMERGENCY ACCESS
TYPE: MTC CS-22
See Figure D-4
TRUCK ACCESS
TYPE: MTC CS-19
See Figure D-5 Upper
EMPLOYEE ACCESS
TYPE: CS-19
See Figure D-5 Lower
INTERSECTION STUDY
AREA: Options displayed on
Figures D-1 and D-2
Scale 1:6000

GENERAL NOTES

1. LOCATION OF ROADS & PROPERTY LINES TO BE FINALIZED FOLLOWING CONFIRMATION BY AERIAL AND/OR LEGAL SURVEY
2. CORE ZONE IS DEFINED AS AN ENVELOPE 400m FROM THE SITE BOUNDARIES, AS ESTABLISHED BY OWMC

Proposed Locations of Site Entrances

FIGURE 4.1

- Increase the separation of these two intersections along Highway 20 so that individual left turn storage lanes could be provided; or

- Realign either Silverdale Road or Schram Road (or both) in such a fashion as to provide a four-leg intersection, thus establishing a common centreline for the two roads at Highway 20; or

- Close Silverdale Road at Highway 20 thus removing the intersection jog.

The first solution would involve the relocation of one of the road intersections at Highway 20 by a minimum of 250 m east or west. This would be the basic need to accommodate the development of one left turn deceleration and storage lane. This approach was eliminated due to the potential for extensive property disruption. The third solution was also eliminated as it would create an unacceptably long cul-de-sac on Silverdale Road and would be disruptive for users and property owners along the route who would be required to divert to alternate routes to access Highway 20. The second solution although potentially disruptive within the immediate environs of the two intersections was viewed to be the preferred solution. Two options were developed and examined to achieve this solution:

- Option 1 - realign Silverdale Road westward to form a four-leg intersection having a common centreline with Schram Road, or

- Option 2 - realign Schram Road eastward to form a four-leg intersection having a common centreline with Silverdale Road

4.2.1 Forecast of site access demands

This analysis required that both the a.m. and p.m. design hours be determined to form the bases for the planning and design of any required improvements at the Schram Road/Highway 20 intersection. The three time periods analyzed included:

- ° year 1990 site construction
- ° year 1995 site operations at the 150 000 t/a throughput
- ° year 2000 site operations at the 300 000 t/a throughput

The basic data inputs to the analyses are available from Tables 4.1, 4.2 and 4.3. The specific information required for the intersectional turning movement analysis on a total daily bases is recorded on the individual tables for road links B.1., B.2. and C.1. However, to produce the a.m. and p.m. design hour forecast, daily movements were disaggregated. The process for this was straight forward in dealing with construction workforce and site employment.

Further adjustment was necessary to deal with truck transport movements in that these were the product of the annual trucking forecasts described earlier. From these a mean hourly arrival/departure forecast was made. These mean hourly rates were then adjusted upwards to produce an hourly rate that has 95% confidence that it will not be exceeded. The clay truck movements during the construction period were not included in these calculations as it was assumed that these would occur in the 8:00 a.m. to 4:30 p.m. time period and not during the peak design periods.

The results of these analyses converted to the a.m. and p.m. design hour demands for the three analysis time periods are displays in Figures 4.2 through 4.7. Each of these figures includes the predicted background peak hour traffic volumes occurring on

1990 CONSTRUCTION TRAFFIC

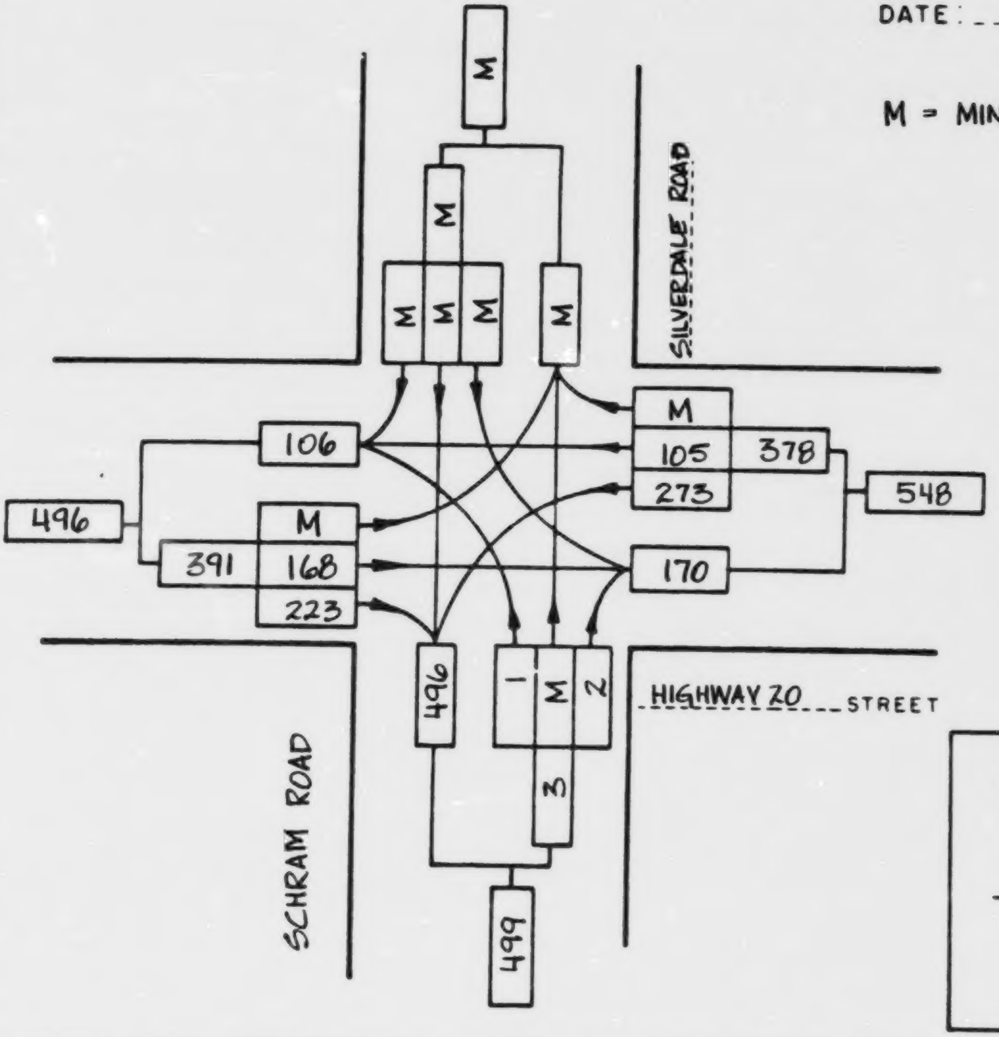
LOCATION HIGHWAY 20 AT SCHRAM / SILVERDALE

PERIOD 0700 - 0800
A.M. PEAK HOUR

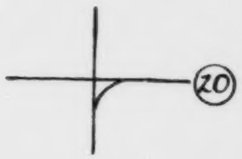
DAY: S M T W T F S

DATE: ______________

M = MINOR MOVEMENT


M
M
M
M
M
M
SILVERDALE ROAD
M
106
105
378
273
548
496
M
391
168
223
170
496
1
M
2
3
499
HIGHWAY 20 STREET
SCHRAM ROAD

ACTUAL LAYOUT OF INTERSECTION



TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	M	M	M	1	M	2	M	168	223	273	105	M
		SHORT TRUCKS				1		2		27	1	2	17	
		LONG TRUCKS												
		A.M. PEAK	M	M	M	1	M	2	M	168	223	273	105	M
		P.M. PEAK												
	24 HOUR VOLUME													
	A.A.D.T.													

Figure 4.2

1990 CONSTRUCTION TRAFFIC

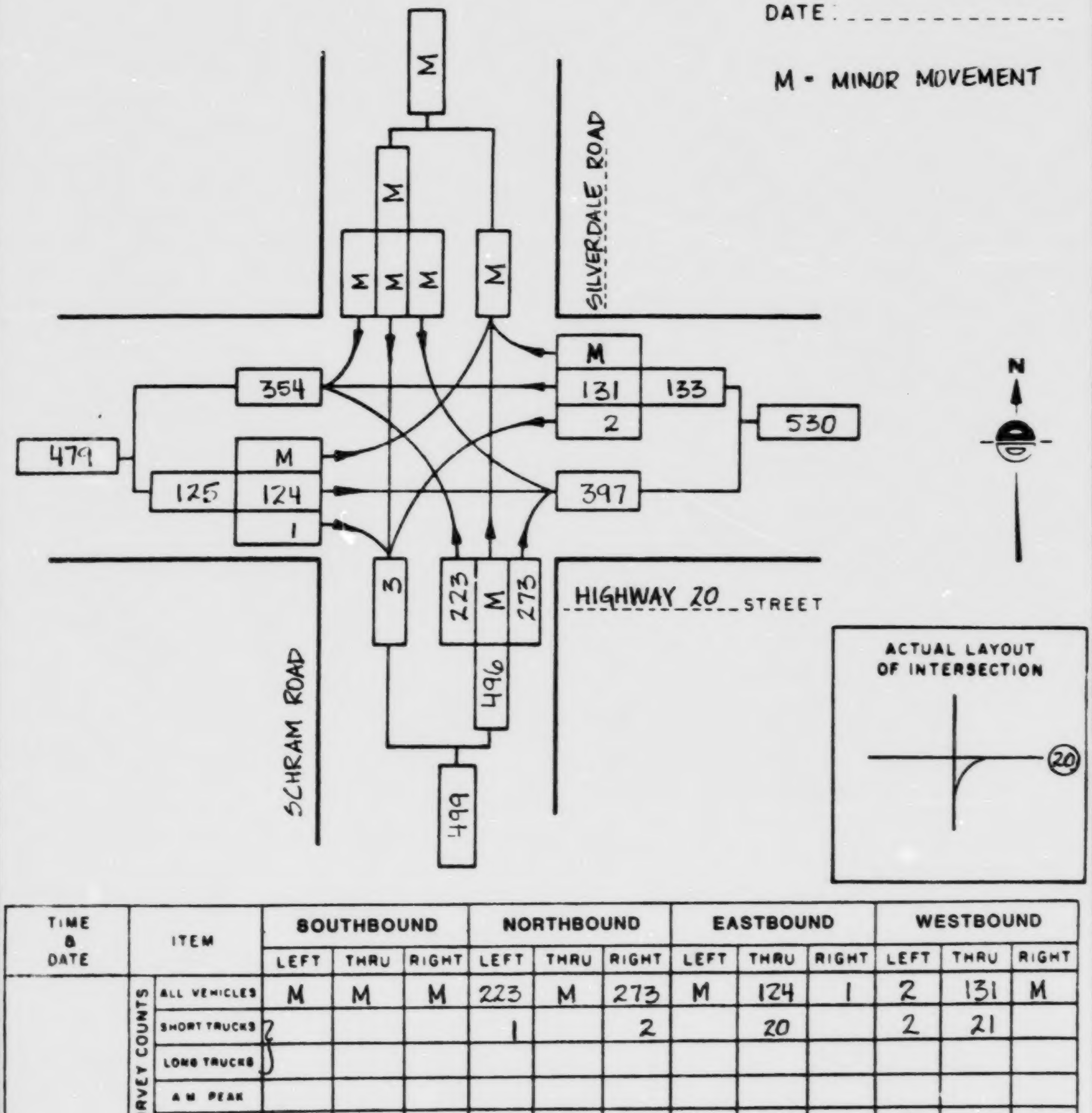
LOCATION HIGHWAY 20 AT SCHRAM/SILVERDALE

PERIOD 1630 - 1730
PM PEAK HOUR

DAY: S M T W T F S

DATE: ______________

M = MINOR MOVEMENT


M
M
M
M
M
M
SILVERDALE ROAD
M
354
131
133
2
530
479
M
125
124
397
1
N
3
223
M
273
HIGHWAY 20 STREET
496
SCHRAM ROAD
499
ACTUAL LAYOUT OF INTERSECTION
20

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	M	M	M	223	M	273	M	124	1	2	131	M
		SHORT TRUCKS				1		2		20		2	21	
		LONG TRUCKS												
		A M PEAK												
		P M PEAK	M	M	M	223	M	273	M	124	1	2	131	M
	24 HOUR VOLUME													
	A A D T													

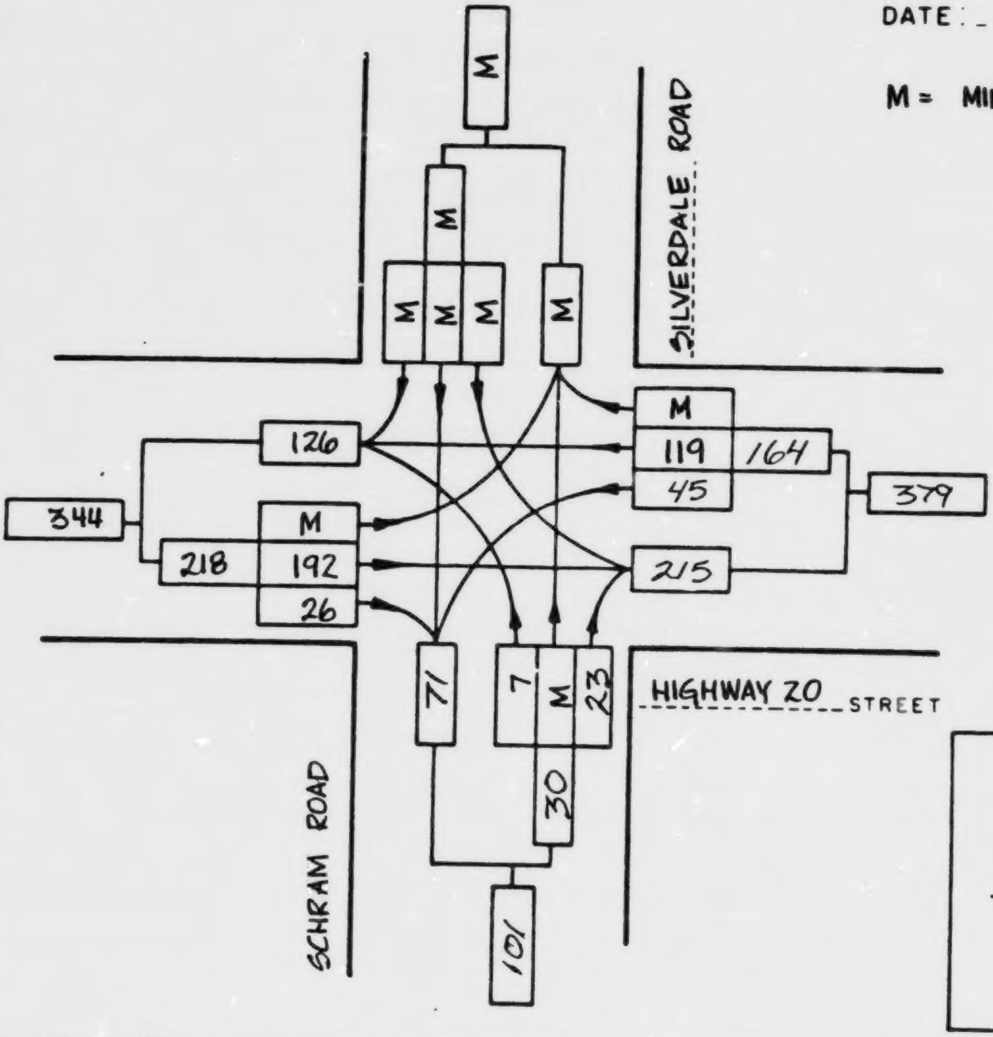
Figure 4.3

1995 OPERATIONS TRAFFIC

LOCATION HIGHWAY 20 AT SCHRAM/SILVERDALE

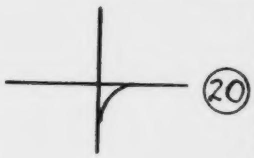
PERIOD A.M DESIGN HOUR*
0700 - 0800
DAY: S M T W T F S
DATE:

M = MINOR MOVEMENT


M
M
M
M
M
M
SILVERDALE ROAD
126
344
218
M
192
26
M
119
164
45
379
215
71
7
M
23
30
101
SCHRAM ROAD
HIGHWAY 20 STREET

N

ACTUAL LAYOUT OF INTERSECTION



TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	M	M	M	7	M	23	M	192	26	45	119	M
		SHORT TRUCKS						13		31		13	19	
		LONG TRUCKS												
		A.M. PEAK	M	M	M	7	M	23	M	192	26	45	119	M
		P.M. PEAK												
	24 HOUR VOLUME													
	A.A.D.T.													

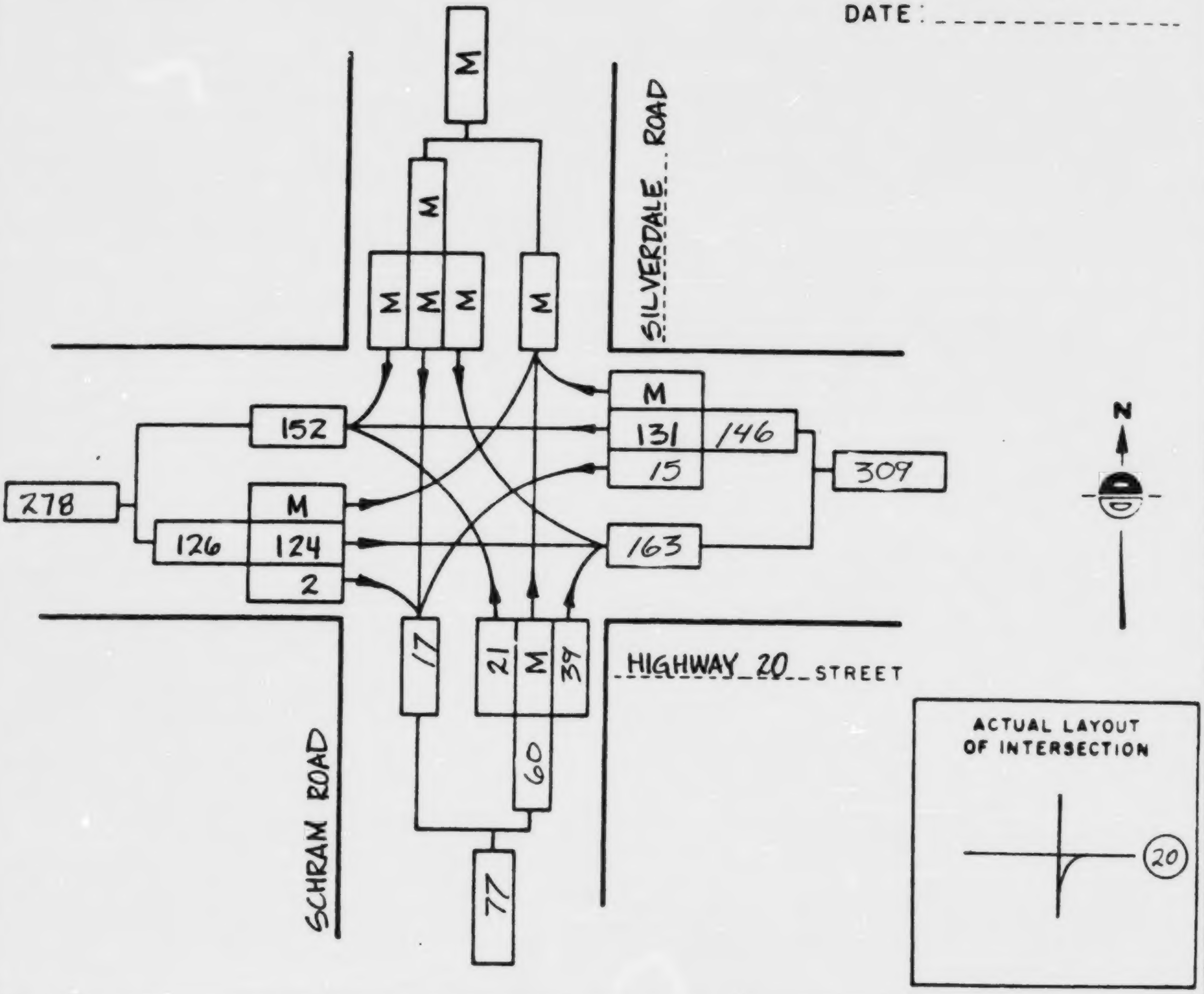
* REPRESENTS 95 % CONFIDENCE LEVEL FOR DESIGN PURPOSES

Figure 4.4

1995 OPERATIONS TRAFFIC

LOCATION HIGHWAY 20 AT SCHRAM/SILVERDALE

PERIOD PM DESIGN HOUR*
1630 - 1730
DAY: S M T W T F S
DATE: ______________


M
M
M
M
M
M
SILVERDALE ROAD
152
M
131
146
15
309
278
126
M
124
2
163
N
17
21
M
39
60
77
HIGHWAY 20 STREET
SCHRAM ROAD
ACTUAL LAYOUT OF INTERSECTION
20

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	M	M	M	21	M	39	M	124	2	15	131	M
		SHORT TRUCKS						13		20		13	21	
		LONG TRUCKS												
		A M PEAK												
		P M PEAK	M	M	M	21	M	39	M	124	2	15	131	M
	24 HOUR VOLUME													
	A A D T													

* REPRESENTS 95 % CONFIDENCE LEVEL FOR DESIGN PURPOSES

Figure 4.5

2000 OPERATIONS TRAFFIC

LOCATION HIGHWAY 20 AT SCHRAM /SILVERDALE

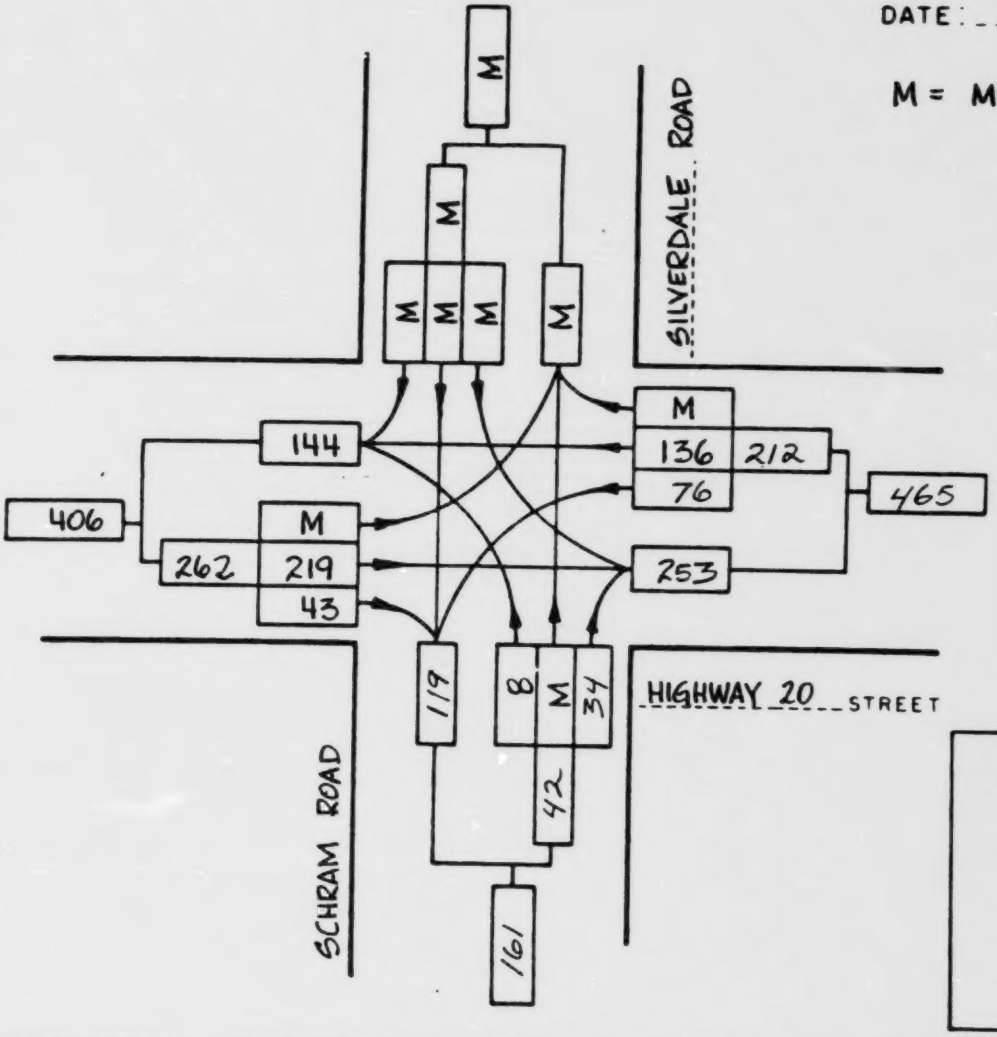
PERIOD AM DESIGN HOUR*

0700 - 0800

DAY: S M T W T F S

DATE:

M = MINOR MOVEMENT


M
M
M
M
M
M
SILVERDALE ROAD
144
406
262
M
219
43
M
136
212
76
465
253
119
8
M
34
42
161
HIGHWAY 20 STREET
SCHRAM ROAD

ACTUAL LAYOUT OF INTERSECTION

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	M	M	M	8	M	34	M	219	43	76	136	M
		SHORT TRUCKS						21		35		21	22	
		LONG TRUCKS												
		A M PEAK	M	M	M	8	M	34	M	219	43	76	136	M
		P M PEAK												
	24 HOUR VOLUME													
	A A D T													

* REPRESENTS 95 % CONFIDENCE LEVEL FOR DESIGN PURPOSES

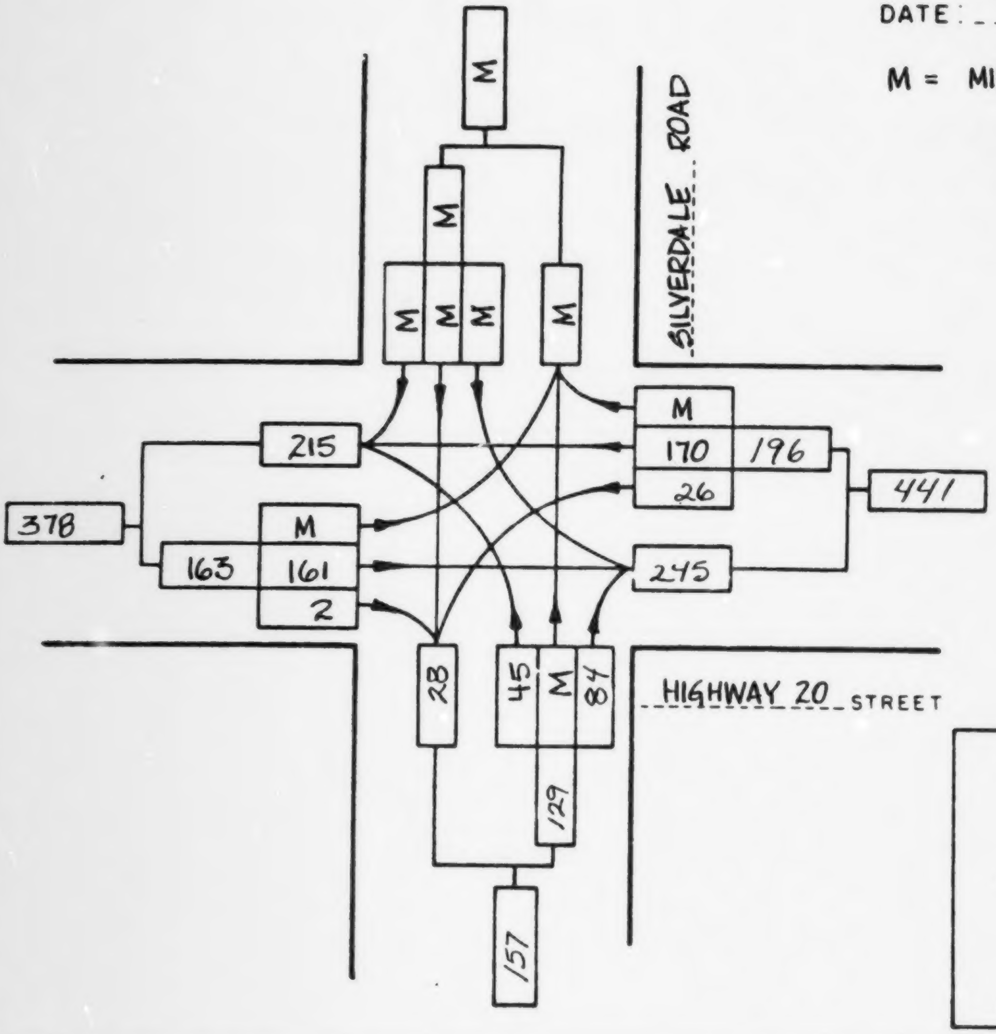
Figure 4.6

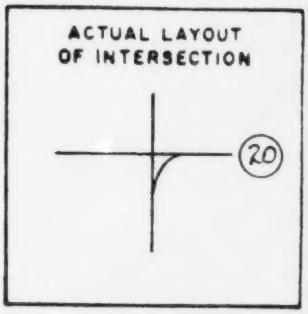
2000 OPERATIONS TRAFFIC

LOCATION HIGHWAY 20 AT SCHRAM/SILVERDALE

PERIOD P.M. DESIGN HOUR*
1630-1730
DAY: S M T W T F S
DATE:

M = MINOR MOVEMENT


M
M
M
M
M
M
SILVERDALE ROAD
M
215
170
196
378
26
441
M
163
161
245
2
28
45
M
84
HIGHWAY 20 STREET
129
157


ACTUAL LAYOUT OF INTERSECTION
20

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	M	M	M	45	M	84	M	161	2	26	170	M
		SHORT TRUCKS						23		26		23	27	
		LONG TRUCKS												
		A M PEAK												
		P M PEAK	M	M	M	45	M	84	M	161	2	26	170	M
	24 HOUR VOLUME													
	A A D T													

* REPRESENTS 95 % CONFIDENCE LEVEL FOR DESIGN PURPOSES

Figure 4.7

Highway 20. These estimates for each of the forecast time periods were developed by applying the directional split of eastbound and westbound traffic volumes, as determined from the MTC turning movement counts at the west leg of the Highway 20/Niagara Regional Road 24 intersection, to the forecasted AADT's during the years 1990, 1995 and 2000. As no significant traffic generators exist between the Niagara Regional Road 24 and Schram Road intersections, no further adjustments were deemed necessary.

4.2.2 Intersection design requirements

Figures 4.2 through 4.7 were then reviewed within the context of Ministry of Transportation and Communications design standards and criteria as published in their manual, Geometric Design Standards for Ontario Highways and Streets. The relevant section of the manual is Chapter E: Intersections At-Grade, dealing with warrants for left turn storage lanes and right turn lane channelization.

The results of the evaluation of design requirements is summarized in Table 4.4 as it applies to each of the analysis time frames. The overall conclusions developed from this summary of requirements are:

- Volumetric warrant is not satisfied for signalization of the intersection and stop or yield sign control is therefore to be assumed for the side roads (Schram Road and Silverdale Road);

- Left turn deceleration and storage lane on Highway 20 is warranted and should be provided to accommodate the from east to south turning movement. This design would then accommodate the opposing left turn movement (from west to north); and

TABLE 4.4
OWMC PHASE 4B - TRANSPORTATION
SUMMARY OF LEFT TURN STORAGE AND RIGHT TURN LANE CHANNELIZATION REQUIREMENTS AT HIGHWAY 20/SCHRAM/SILVERDALE INTERSECTION

	SUMMARY OF WARRANT EVALUATION AT HIGHWAY 20 INTERSECTION		
OPERATING CONDITION	L.T. STORAGE LANE FROM EAST TO SOUTH	R.T. CHANNELIZATION FROM WEST TO SOUTH	R.T. CHANNELIZATION FROM SOUTH TO EAST
Construction at OWMC Site 1990 - 1991	Warrant Satisfied for a.m. design hour with 50-60m storage (signal may be required)	Warrant Satisfied for a.m. design hour 223 vph>60 vph	Warrant Satisfied for p.m. peak hour 273 vph>60 vph
Operation at[2] OWMC Site 1995	Warrant not[2] satisfied at 45 LT vph	Warrant not[2] satisfied 26 vph< 60 vph	Warrant not[2] satisfied 39 vph< 60 vph
Operation at OWMC Site 2000	Warrant Satisfied 25 m storage lane required	Warrant not satisfied 43 vph<60 vph	Warrant Satisfied for p.m. peak hour 84 vph>60 vph

NOTES:

1. Assumed design speed on Highway 20 is 90 km/hr.

2. Warrant may be satisfied if construction force on-site for plant expansion during operations at this level in 1995.

- Channelized right turn movement from Schram Road to Highway 20 is warranted and should be provided to accommodate the turning movement from south to east.

4.2.3 Schram/Highway 20/Silverdale intersection design

Preliminary engineering design of this intersection was then undertaken. Appendix D - Figure D.1 defines these requirements assuming the westerly relocation of Silverdale Road. Figure D.2 portrays the second option assuming the easterly relocation of Schram Road. As both plans were prepared for purposes of an impact assessment involving other OWMC consultants, the probable land acquisition needs associated with each option was also noted. The final land acquisition requirements cannot be confirmed until an option is selected and final engineering design is completed.

As a part of the evaluation process, the preliminary design plans (Figures D.1 and D.2) were transmitted to MTC and the Township requesting their comments, concerns or preference for individual options. The actual materials transmitted to each agency are included in Appendix D to this report. The response received is also included in this appendix.

Approval of the option ultimately selected by OWMC will also require the approval of design and construction plans by the Ministry of Transportation and Communications, and the Township of West Lincoln, as both agencies have jurisdiction over the roadways involved. This also involves agreement for the implementation of the construction works and land acquisition needs.

4.2.4 Inputs to option evaluation

The transportation consultant prepared two inputs for the evaluation of the two intersection improvement options. These were construction costs and operational suitability. The construction cost estimates cover all normal road works within the described areas of improvement as illustrated by the preliminary design plans in Figures D.1 and D.2 (see Appendix D). Material quantity estimates were developed using these plans and cross sectional plans prepared from the MTC construction plans and profiles extracted form the most recent Highway 20 road improvement contract. These contract plans also provided the basis for the determination of additional right-of-way required to implement the improvements.

Specific quantity estimates included excavation, granular material, paving, saw cuts, lighting and curb and gutter placement. Other items included percentage allowances for: minor items 5%, drainage 15%, engineering and contingencies 25%. The resulting cost estimates (see Appendix D) for all works displayed an insignificant ($5 000) difference between the two options. This was considered to be smaller than the probable level of accuracy of the estimates. Therefore, the construction cost used for each of the options were considered equal.

In terms of traffic operations and safety no differences could be discerned for each of the options. This is a consequence of the application of identical criteria for the design of each option. The only basic difference between the two options is locational, i.e. a 57 m difference in the location of the centreline of the intersection with Highway 20. Consequently, for purposes of traffic operations and safety the features of each option are considered to be equal.

4.2.5 Selection of a preferred option and design modification

Based upon the evaluation of the access options documented in the report, M.M. Dillon Limited, August 1987, OWMC Environmental

Assessment - Site Assessment Volume, it was concluded that the realignment of Schram Road on the south side of Highway 20 would be selected as the preferred option.

The preferred design was modified slightly following the selection in order to respond to the comments received from the Ontario Ministry of Transportation and Communications in their November 12, 1986 correspondence to M.M. Dillon Limited. A copy of this correspondence is contained in Appendix D. The modifications involved shifting the Highway 20 alignment 1.5 m to the south in order that the left turn lanes would straddle the existing centre line. Figure D-3 contains the revised alignment for the intersection.

The estimated costs for the preferred Schram Road/Highway 20 intersection design (Appendix D, Figure D-3) were also modified based on the comments received from the Ontario Ministry of Transportation and Communications Geotechnical Division. Their comments are contained in their correspondence to M.M. Dillon Limited dated 1 December 1986, and is contained in Appendix D. As a result the cost of the intersection reconstruction is estimated to be $500 000.

4.3 Design of Site Entrances

The site access requirements and function were discussed in Section 4.1 of this chapter. This section identifies the recommended treatment for each entrance design and the costs associated with provision of these.

Entrance designs for the various site functions are based on those suggested by the Ministry of Transportation and Communications as detailed in their publication, January 1982, Commercial

Site Access Policy and Standards - Metric, ADM-S-416, 78-05. Although the rationale for their designs concerns control of access on Provincial Highways to ensure public safety and protection of the operating integrity of these arterial routes, they are assumed to be appropriate for entrance treatment on all other lesser road classes.

4.3.1 Emergency access to Highway 20

This access to Highway 20 is proposed to be located some 560 m to the west of the existing Schram Road/Highway 20 intersection. The location is coincident with the location of a utility service corridor into the site.

As approval of both the entrance location and type falls within the jurisdiction of MTC, the proposal has been submitted to the Ministry in a letter dated 22 September 1986. The conditions of approval are as indicated in their letter of response dated 12 November 1986 (see Appendix D).

A construction cost estimate including engineering and contingencies of $22 500 was calculated for the implementation of this access. No additional property requirements are identified in that the OWMC property acquisition and existing public roadway allowance are contiguous.

4.3.2 Accesses on Schram Road

Schram Road will require major reconstruction to accommodate the site traffic generation imposed by OWMC facility operation including the addition of heavy vehicle loadings. A two-lane Class A type road with adequate shoulders is required. As this roadway falls within the jurisdiction of the Township of West Lincoln, the detailing of suitable design criteria should be established in consultation with the Township. This is likely to include the need for drainage and culvert improvements along the entire road section.

For purposes of our analysis and the preliminary costing of road improvements, it was assumed that a paved road width of 7 m and 2 m granular shoulders each side, would be developed.

Three of the four site entrances from Schram Road would be developed for medium and heavy truck movements. Thus, an MTC CS-19 truck access design was selected for all entrances as the design assumption. The features of this design are portrayed in Figure D.5 of Appendix D. The truck entrance design would be based on the design illustration in the upper half of the figure and includes a 50 m entrance taper. The lower half illustrates a reasonable design for the employee/visitor access and excludes the deceleration lane taper.

It is to be emphasized that the design assumptions described above were largely taken for purposes of preparing cost inputs to be applied in the comparative evaluation of access road entry points. The actual design features to be applied for purposes of site development will require consultation with the Township of West Lincoln as approvals for site access are required. To initiate the consultation process in all matters concerning Schram Road, preliminary contact was established by correspondence and comments were solicitated for input to our work. This documentation is included in Appendix D.

A cost estimate was prepared for improvements to Schram Road and the development of the required four site entrances from Schram Road. The combined estimated cost including engineering and contingencies for all identified roadworks is $1 020 000 (reconstruction of 300 metres of Schram near Highway 20 is included in the intersection construction cost). No additional property acquisition has been identified for these works as it was assumed that basic roadway improvements could be accommodated within the existing road right-of-way (20 m existing) and within the OWMC property acquisition.

4.4 Western Site Access Option

Public input received during the review of the two Schram Road/ Silverdale Road realignment options prompted OWMC to re-examine the western site access option. This access option consisted of an intersection with Highway 20 and an access road leading to the main site entrance with two access points to the site perimeter roadway. The details of the road design for this access option are discussed in Appendix D and are shown in Figures D-7 and D-8.

The design of the western access intersection with Highway 20 was based upon the same traffic characteristics applied to the Schram Road intersection, and incorporate the comments from Ministry of Transportation and Communications regarding the original design. Therefore both intersection designs at Highway 20 are essentially the same. The intersection layout (as shown in Figure D-7) was submitted by letter to the Ontario Ministry of Transportation and Communications on 30 June, 1987 for their review and comments. This communication is also included in Appendix D.

The location and alignment of the western access roadway was selected to minimize impacts to private access roads on Highway 20, and to accommodate the vehicles expected to enter/exit the facility. The proposed alignment of the road south of Highway 20 is shown in Figure D-8.

A comparative evaluation of the Schram Road and Western site access was undertaken by M.M. Dillon site assessment consultants utilizing the inputs from various disciplines. This study, documented in the report, M.M. Dillon Limited, 1987, OWMC Environmental Assessment - Site Assessment Volume, concluded that the two options were very similar in terms of impact.

5. RISK AND IMPACT ANALYSIS

5.1 Introduction

The transportation risk and impact analysis discussed in this section deals with the effects of the OWMC traffic on the access road environment and operation. As outlined earlier there are four transportation factors under consideration:

- Risk Related:
  - Risks due to Fatal or Injury Accidents Involving OWMC traffic
  - Spill Frequency
- Impact Related:
  - Impact on Traffic Operations Along Access Route
  - Accident Involvement Frequency

These risks and impacts have been calculated based upon the estimated traffic impacts of the OWMC facility as outlined in the Section 3, and the methodology described in Chapter 2.

5.1.1 Truck routings/access route

During the Phase 4A analyses it was noted that not all trucks hauling special wastes, and additives and reagents to the OWMC facility would use the preferred local and regional access route. The results of this finding were discussed in Chapter 2, Section 6.3.3 of the report, M.M. Dillon Limited, October 1985, Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Transportation. This finding had no significance in the Phase 4A analysis, in that all OWMC truck generation occurring on any route other than the local and regional access route was therefore included in the province-wide factor data developed for each of the candidate sites.

During Phase 4B site assessment analyses, this finding has some level of significance since site specific analysis was limited to the local and regional access route to the preferred site. In the Phase 4A analyses, all risk related factor data (accident involvements, spill frequencies, etc.) are set out in subsequent analyses for the access route. The province- wide system components do not change significantly from the Phase 4A report (M.M. Dillon Limited, October 1985, Sections 5 through 8 of Chapter 8). However, there is some concern related to the impact of these movements along other roads up to the point where these hauling movements enter the defined access route to the site or at the site entrance. The significance of these movements is addressed in the balance of of this section.

This special analysis is based upon the data presented in the Phase 4A transportation report (M.M. Dillon Limited, October 1985) and a disaggregation of special waste generation generally within the St. Catharines-Niagara zone of generation. Based upon the results of this analysis and assuming routings from each of the nearby local municipal areas, e.g. St. Catharines, Niagara Falls, Welland, Dunnville, West Lincoln, etc., the OWMC workday frequency of special waste haulage was estimated to be as follows:

- From the QEW south on Niagara Regional Road 24, 66.7% of trucks;
- From Niagara Regional Road 81/24 intersection, 0.17% of trucks;
- From Highway 20 east of the Niagara Regional Road 24/Highway 20 intersection, 17.5% of trucks;
- From Niagara Regional Road 24 south of the Highway 20/Niagara Regional Road 24 intersection, 15% of trucks;
- From Highway 20 west of the LF-9C site, 0.6% of trucks.

Thus it is seen that 99.4% of all special waste truck movements are estimated to use all or a portion thereof of the defined access routes up to the Highway 20/Schram Road site entrance. The remainder (0.6%) of special wastes would arrive via Highway 20 to the west of the site entrance. These include local movements of waste from the Dunnville and West Lincoln areas.

There are a number of uncertainties involved. The most significant one concerns the routing that would be used from the Niagara-on-the-Lake and St. Catharines areas to the site. Based upon the transportation centroid (the point selected for road network loading), waste from these areas would use Highway 406 at St. Catharines to Highway 20 and would then travel to the site via this route. Had the QEW routing to Niagara Regional Road 24 been selected, the 66.7% of trucks at this gateway would increase to 75% and the percentage arriving from the east on Highway 20 at the Niagara Regional Road 24/Highway 20 intersection would be reduced from 17.5% to 9.2%.

To assess the significance of the traffic impacts associated with the use of 'other' routes, the prior estimates were used and these were applied at the year 1995 and 2000 OWMC facility operating levels to calculate the additional two-way truck movements that are estimated to occur on these routes. This assessment has been made on the road link immediately adjacent to the defined local and regional access route and is displayed in Table 4.5.

Considering the maximum impact year 2000, at which time the OWMC facility is assumed to operate at full capacity involving the transport of 300 000 t/a of special wastes, the volumetric change on 'other' routes that may accommodate special wastes trucking is insignificant. The maximum change is expected to occur on Highway 20 east of the Niagara Regional Road 24 intersection. The volumetric change is less than one half of one percent of the year 2000 baseline traffic volume. Using the change in the traffic loadings to assess the impact of OWMC operations, it is evident that it would be of very low significance. Similarly, the impact of added accident involvements, spill frequencies and risk of fatal and injury accident involvements would be much smaller.

Based upon the very low significance of OWMC operations on 'other' possible access routes, no further consideration has been given to these.

TABLE 4.5

OWMC PHASE 4B - TRANSPORTATION

COMPARISON OF TWO-WAY DAILY OWMC SPECIAL WASTE TRUCK TRAFFIC VOLUMES ON 'OTHER ROUTES' WITH YEAR 1995 AND 2000 BASELINE VOLUMES

	1995 TRAFFIC VOLUME			2000 TRAFFIC VOLUME		
OTHER ROUTES LOCATION	BASELINE[1] AADT EST.	OWMC[2] OPERATING WEEKDAY	PERCENT CHANGE	BASELINE[1] AADT EST.	OWMC[2] OPERATING WEEKDAY	PERCENT CHANGE
NRR 81 West of NRR 24	4 028	0.14	+0.003	4 095	0.27	+0.007
Highway 20 east of NRR 24	5 734	14	+0.24	5 929	28	+0.47
NRR 24 south of Highway 20	6 805	12	+0.18	8 524	24	+0.28
Highway 20 west of Schram Road	3 610	0.48	+0.013	3 720	0.95	+0.03

Notes:

1. Baseline AADT estimated using Roads Needs Study 10-year growth rate.
2. Operating weekday special waste truck volume estimated based on percent of total generation set out in Section 5.1.1 and two-way volume of 80 vehicles in 1995 and 158 vehicles in 2000.

5.2 Spill Frequency

The spill frequency (along the preferred local and regional access route only) factor is represented by two indicators:

- spills resulting from motor vehicle collisions, and
- other in-transit spills

The first indicator deals with the possibility of a spill of special wastes or additive and reagents due to an accident along the access road involving the OWMC generated trucks carrying these materials. Based on Ontario research applied in Phase 4A, approximately 19.6% of the truck accidents involving carriers of special wastes resulted in spills of various sizes.

Other in-transit spills are spills which occur without a motor vehicle accident involvement. These spills occur due to equipment malfunctions such as leaking values or overflow of materials. In Phase 4A, it was estimated that such spills of any size would occur once every one million vehicle kilometers of transport vehicle travel.

On their own these spill frequencies represent only one component of the risk considerations. When these frequencies are combined with receptor data, a total risk assessment is derived.

Table 4.6 lists the spill frequencies expected for the (1995) 150 000 tonnes per annum typical operation scenario along each section of the access road, for the special wastes, and additive/ reagents materials.

TABLE 4.6

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF SPILLS ON THE LOCAL AND REGIONAL ACCESS ROUTE
150,000 t/a OF SPECIAL WASTE - TYPICAL OPERATION

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)	ANNUAL NUMBER OF SPILLS		
						NON ACCIDENT RELATED (3)	ACCIDENT RELATED (4)	TOTAL
A. VINELAND TOWLINE ROAD (RR.24)								
1. QEW to RR. 81	3.8	2.28	Special Wastes	6,550	0.155	0.025	0.015	0.040
			Additives & Reagents	1,087	0.026	0.004	0.003	0.007
			TOTAL	7,637	0.181	0.029	0.018	0.047
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	6,550	0.068	0.005	0.007	0.011
			Additives & Reagents	1,087	0.011	0.001	0.001	0.002
			TOTAL	7,637	0.080	0.005	0.008	0.013
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	6,550	0.014	0.007	0.001	0.009
			Additives & Reagents	1,087	0.002	0.001	.000	0.001
			TOTAL	7,637	0.017	0.008	0.002	0.010
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	6,550	0.174	0.023	0.017	0.040
			Additives & Reagents	1,087	0.029	0.004	0.003	0.007
			TOTAL	7,637	0.203	0.027	0.020	0.047
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	6,550	0.145	0.020	0.014	0.034
			Additives & Reagents	1,087	0.024	0.003	0.002	0.006
			TOTAL	7,637	0.169	0.023	0.017	0.040
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	6,550	0.188	0.027	0.018	0.045
			Additives & Reagents	1,087	0.031	0.004	0.003	0.008
			TOTAL	7,637	0.219	0.031	0.021	0.053
B. HIGHWAY 20								
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	9,776	0.182	0.050	0.018	0.068
			Additives & Reagents	1,102	0.020	0.006	0.002	0.008
			TOTAL	10,878	0.202	0.055	0.020	0.075
C. SCHRAM ROAD								
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	9,776	0.045	0.009	0.004	0.013
			Additives & Reagents	1,134	0.005	0.001	0.001	0.002
			TOTAL	10,910	0.050	0.010	0.005	0.015
ACCESS ROUTE TOTALS	22.2		Special Wastes	9,776	0.971	0.165	0.095	0.260
			Additives & Reagents	1,134	0.149	0.024	0.015	0.039
			TOTAL	10,910	1.121	0.189	0.110	0.299

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the typical operation treatment process defined by Monenco Limited, 22 Sept 1986
2. Derived from all vehicle accident involvement rate using a factor of 1.37.
3. Based on one spill per MVkm..
4. Derived using a conditional probability of 0.196, applied to one-way OWMC annual accident involvment.

The table indicates that each material has a different spill frequency based on the number of vehicles generated, and that in each case there will be less than one spill annually. The following is a summary of the spill frequency of catagories of materials which contain items which may affect human health on the access route:

Material	Total Estimated Spills on Access Route (150 000 tonnes/annum; typical)
° special wastes:	1 spill every 3.8 years
° additives/reagents:	1 spill every 25.6 years
Total materials:	1 spill every 3.3 years

Only a small proportion of the spills represented by the estimated spill frequencies tabulated above would pose a risk to human health or the environment. The risks associated with spills are developed in the report, Environ Corporation, 1987 Site Assessment - Phase 4B Risk Assessment.

5.3 Accident Involvement Frequency

The generation of additional traffic along the local and regional access route will lead to the possibility of a number of accidents involving medium and heavy trucks carrying special wastes, process treatment materials, excess clay and granular material, or employees to/from the site. To estimate the frequency of these accident involvements, it was necessary to apply the historical all-vehicle accident involvement weighted mean rate of 1983 to 1985 and truck accident relationships as described in Chapter 2. Table 4.7 presents the accident involvement frequency for OWMC

TABLE 4.7

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF OWMC TRUCK ACCIDENT INVOLVEMENTS ON THE LOCAL AND REGIONAL ACCESS ROUTE
150,000 t/a OF SPECIAL WASTE - TYPICAL OPERATION

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)
A. VINELAND TOWLINE ROAD (RR.24)					
1. QEW to RR. 81	3.8	2.28	Special Wastes	6,550	0.155
			Additives & Reagents	1,087	0.026
			Granular & Clay	0	0.000
			TOTAL	7,637	0.181
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	6,550	0.068
			Additives & Reagents	1,087	0.011
			Granular & Clay	0	0.000
			TOTAL	7,637	0.080
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	6,550	0.014
			Additives & Reagents	1,087	0.002
			Granular & Clay	0	0.000
			TOTAL	7,637	0.017
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	6,550	0.174
			Additives & Reagents	1,087	0.029
			Granular & Clay	8,085	0.215
			TOTAL	15,722	0.418
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	6,550	0.145
			Additives & Reagents	1,087	0.024
			Granular & Clay	8,085	0.179
			TOTAL	15,722	0.349
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	6,550	0.188
			Additives & Reagents	1,087	0.031
			Granular & Clay	8,085	0.232
B. HIGHWAY 20			TOTAL	15,722	0.450
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	9,776	0.182
			Additives & Reagents	1,102	0.020
			Granular & Clay	8,085	0.150
C. SCHRAM ROAD			TOTAL	18,963	0.352
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	9,776	0.045
			Additives & Reagents	1,134	0.005
			Granular & Clay	8,085	0.037
			TOTAL	18,995	0.087
ACCESS ROUTE TOTALS	22.2		Special Wastes	9,776	0.971
			Additives & Reagents	1,134	0.149
			Granular & Clay	8,085	0.813
			TOTAL	18,995	1.934

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the typical operation treatment process defined by Monenco Limited, 22 Sept 1986; and clay export quantities M.M. Dillon Ltd., 28 may 1987
2. Derived from all vehicle accident involvement rate using a factor of 1.37.

generated truck traffic on the access road based on typical operation at 150 000 $^{t}/_{a}$.

The impact of OWMC generated vehicle accident involvements is addressed by comparing them to the estimated number of all-vehicle accident involvements in the background traffic. Table 4.8 compares the estimated number of accident involvements in the background traffic with those by OWMC generated vehicles for the 1995 year of plant operations. This comparison indicates that along the total access route the number of annual accident involvements associated with the OWMC generated traffic will increase 1.6% from 145 to approximately 147 accident involvements. The majority of the OWMC generated traffic accident involvements (1.9 annually) will involve OWMC trucks, while the remainder (1 every 2.3 years) will involve employee traffic between the site entrance and Niagara Regional Road 24.

5.4 Risks Associated with Accident Involvement

The estimated annual number of OWMC generated vehicles involved in accidents along the local and regional access road includes the possibility of risks to human health. The human health related consequences of a motor vehicle accident involvement can be grouped into personal injuries or fatalities. Therefore to estimate the risks associated with accidents involving OWMC generated traffic it is necessary to discern the number of involvements which result in fatal or personal injury accidents.

The possibility of an involvement in a fatal or personal injury accident is based on the historical accident records. Since the occurrence of fatal or injurious accidents is a relatively rare event, a large historical database is required to provide a reliable estimate. For this reason the provincial and regional accident trends for year 1983 through 1985 were applied

TABLE 4.8
OWMC PHASE 4B - TRANSPORTATION
IMPACT ON NUMBER OF ACCIDENT INVOLVEMENTS ON LOCAL AND REGIONAL ACCESS ROAD WITH OWMC OPERATION IN YEAR 1995 - TYPICAL OPERATION

Access Route Link Description	Estimated Number of Accident Involvements/Year: Year 1995 Baseline[1]	OWMC Traffic: Trucks[2]	OWMC Traffic: Employees[3]	OWMC Traffic: Total	% Change from Baseline
A. Vineland Townline Road (RR 81)					
1. QEW to NRR 81	38.0	0.181	-	0.181	+ 0.5%
2. NRR 81 to Moyer	16.0	0.080	-	0.080	+ 0.5%
3. Moyer to NRR 73	3.0	0.017	-	0.017	+ 0.6%
4. NRR 73 to Ninth	31.0	0.418	-	0.418	+ 1.3%
5. Ninth to NRR 26	23.0	0.349	-	0.349	+ 1.5%
6. NRR 316 to Hwy. 20	25.0	0.450	-	0.450	+ 1.8%
B. Hwy. 20					
1. NRR 24 to Schram	9.0	0.352	0.339	0.691	+ 7.7%
C. Schram Rd.					
1. Hwy. 20 to LF-9C	<1	0.087	0.092	0.179	<179.0%
TOTAL ACCESS ROUTE	145.0+	1.934	0.431	2.365	+ 1.6%

NOTES:

1. From Table 3.3. Values Rounded.
2. From Table 4.7.
3. Based on annual two-way trips derived from Table 4.2, and the 1983-85 all-vehicle accident involvement rate.

to this analysis. During this period there were over one half million motor vehicle accidents in Ontario, and over 24 000 in the Regional Municipality of Niagara. This compares to less than 200 motor vehicle accidents along the local and regional access route over the same time period.

The provincial accident records for 1983 to 1985 contain sufficient information to estimate the possibility of a medium or heavy truck being involved in a fatal, or injurious accident. However, the data available for the Region of Niagara experience was limited to the number of all-vehicle accident events being fatal or injurious. Therefore it was necessary to compare the province-wide accident event experience to the Niagara accident event experience in order to discern any difference in trends which may arise due to the general geographic characteristics of the region.

Table 4.9 presents a comparison of the provincial and regional all-vehicle accident severity. This comparison indicates that both databases are relatively consistant in terms of the proportion of fatal and injurious accidents, with a slightly larger proportion of property damage type accidents occurring in Niagara Region. Therefore it would appear reasonable to assume that the provincial database can represent the Niagara Region experience in terms of the severity of accidents.

For the OWMC risk analysis it was necessary to investigate the heavy and medium truck accident severity. This information was available only on a province-wide basis; however, it has been demonstrated previously that the Niagara Region accident experience is similar to the province-wide experience. Table 4.10 presents annual data on the severity of heavy and medium truck accident involvements from 1983 to 1985 in the Province of Ontario. The truck involvements in this table only include

TABLE 4.9
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF PROVINCIAL AND REGIONAL PROPORTIONS OF FATAL AND INJURIOUS ACCIDENT EVENTS
1983 TO 1985

	Ontario Accident Experience				Region of Niagara Accident Experience			
Year	Total No. of Accidents	% Fatal	% PI	% PD	Total No. of Accidents	% Fatal	% PI	% PD
1983	181 999	0.6	34.4	65.0	7 969	0.6	33.3	66.2
1984	194 782	0.5	33.9	65.6	8 134	0.6	33.1	66.2
1985	189 750	0.5	38.9	60.5	8 037	0.6	36.3	63.2
1983-85	566 531	0.5	35.8	63.7	24 140	0.6	34.2	65.2

Sources: Ontario Motor Vehicle Accident Facts; MTC 1983, 1984.

Ontario Road Safety Annual Report; MTC 1985.

TABLE 4.10
OWMC PHASE 4B - TRANSPORTATION
FATAL AND INJURIOUS ACCIDENT INVOLVEMENTS IN ONTARIO FROM 1983 TO 1985

A. Medium and Heavy Truck Accident Involvements

	Number of Medium and Heavy Truck Accident Involvements[1]		
Year	Total	Fatal	Personal Injury
1983	9 487	180 (1.9%)	2 675 (28.2%)
1984	11 208	131 (1.2%)	3 003 (26.8%)
1985	11 211	151 (1.3%)	3 499 (31.2%)
1983-1985	31 906	462 (1.4%)	9 177 (28.8%)

B. Passenger Car and Van Accident Involvements

	Number of Passenger Cars and Vans Accident Involvements		
Year	Total	Fatal	Personal Injury
1983	26 1272	990 (0.4%)	84 206 (32.2%)
1984	25 1653	1 050 (0.4%)	83 563 (33.2%)
1985	26 7684	1 053 (0.4%)	102 833 (38.4%)
1983-1985	78 0609	3 093 (0.4%)	186 396 (34.7%)

Notes:

1. Only includes trucks where a Class "D" or "A" license is required (i.e. gross weight exceed 11 000 kg).

Source: Ontario Motor Vehicle Accident Facts; MTC 1983, 1984.
Ontario Road Safety Annual Report; MTC 1985.

vehicles where the gross vehicle weight exceeds 11 000 kg, and indicate that 1.4% of the involvements were fatal, and 28.8% were personal injury.

Similar province-wide information is provided in Table 4.10 regarding passenger cars and vans involved in fatal or injurious accidents between 1983 and 1985. This information indicates that 0.4% of the vehicle involvements were fatal, and 34.7% were personal injury.

This Ontario-wide accident involvement experience was applied to the accident frequency data for OWMC generated trucks and employee traffic presented earlier to estimate the risk of a fatal or personal injury accident involvement along the access route during the 1995 site operations. The results are presented in Table 4.11.

5.5 Impacts on Traffic Operations

The possible impacts of the OWMC facility on traffic operations along the access route are examined in this section. The analysis has been divided into the following areas of traffic operations:

- level-of-service at major intersections
- traffic operations along road sections

Each of the areas deal with two time horizons for site assessment (assuming the environmental approval is obtained prior to 1990):

- 1990 site construction
- 1995 site operations at 150 000 tonnes/annum

TABLE 4.11
OWMC PHASE 4B - TRANSPORTATION
RISK OF FATAL OR PERSONAL INJURY
ACCIDENT INVOLVEMENT ON ACCESS ROUTE
FOR YEAR 1995 - 150 000 TONNES/ANNUM

Type of OWMC Vehicle		Estimated Annual Risk to Health due to Accident Involvements by OWMC Generated Vehicles[1]	
	Fatal Accident	Personal Injury	Combined Risk
Trucks :	1 every 36.9 years	1 every 1.8 years	1 every 1.7 years
Employees :	1 every 580 years	1 every 6.7 years	1 every 6.6 years
TOTAL :	1 every 34.8 years	1 every 1.4 years	1 every 1.4 years

Notes:

1. Risk based on accident involvement frequency presented in Table 4.8, and proportion of fatal and injurious accident involvements in Tables 4.10.

2. Employee travel traffic risks presented for access road from entrance to Niagara Regional Road 24 only.

The impacts are assessed in terms of the OWMC generated traffic surcharged onto the baseline conditions for each time frame. The baseline traffic is discussed in Chapter 3 Sections 2.2 and 2.3 while the OWMC generated traffic forecasts are presented in Sections 3.1 and 3.2 this chapter.

5.5.1 Level-of-service at major intersections

The level-of-service at an intersection can constrain the operation of the adjacent traffic links. The access route to the site contains two major signalized intersection:

- Niagara Regional Road 24 at Niagara Regional Road 81
- Niagara Regional Road 24 at Highway 20

The traffic impacts at the latter intersection will be examined considering employee and truck traffic generated by the site during the two time horizons.

The intersection's peak hour level-of-service is based upon the traffic demands expected during the peak hour of the intersection's operation. This traffic demand is the combination of background baseline volumes and the traffic generated by the OWMC facilities during the peak hours. Table 4.12 describes the truck and employee traffic generation by the site during the two horizon periods for the a.m. and p.m. periods.

The amount of peak hour traffic in each direction along Highway 20 is dependent on the distribution of the employee trips generated by the site. This distribution pattern is discussed in Section 3 of this chapter. As the employee traffic proceeds farther from the site it is more difficult to estimate the distribution patterns as an increasing number of opportunities exist for

TABLE 4.12
OWMC PHASE 4B - TRANSPORTATION
PEAK HOUR TRAFFIC GENERATION
TO/FROM OWMC FACILITY

Construction Peak Period (December 1990)

A.M. Peak Hour Vehicles					P.M. Peak Hour Vehicles				
Time	Direction	Employees	Trucks	Total	Time	Direction	Employees	Trucks	Total
0700-0800	IN:	493	3	496	1630-1730	IN:	0	3	3
	OUT:	0	3	3		OUT:	493	3	496
	TOTAL:	493	6	499		TOTAL:	493	6	499

150,000 Tonnes/Annum (1995)

A.M. Peak Hour Vehicles					P.M. Peak Hour Vehicles				
Time	Direction	Employees	Trucks[1]	Total	Time	Direction	Employees	Trucks[1]	Total
0700-0800	IN:	58	8	66	1630-1730	IN:	4	8	12
	OUT:	17	8	25		OUT:	47	8	55
	TOTAL:	75	16	91		TOTAL:	51	16	67

Notes:

1. Number of trucks based on average hourly volume for typical operations and differs from the 95% confidence level values used in the intersection design volumes (Figures 4.4 and 4.7).

alternate routing. Therefore, the impacts of the employee traffic considered only as far as the Highway 20/Niagara Regional Road 24 intersection.

The distribution of employee trips on Highway 20 has been assumed to be as follows:

- 45% to the west
- 55% to the east

At the intersection of Highway 20 and Niagara Regional Road 24 the distribution is assumed to be equal in all directions. The resulting distribution of OWMC generated traffic at the Highway 20/Niagara Regional Road 24 intersections is shown in Figure 4.8.

Based on the identified traffic demands, the level-of-service of this intersection during the peak hours for the two horizon periods is discussed in the following subsection.

a) Construction peak period (1990)

Although site construction extends over a two-year period, the construction peak period covers approximately six months in late 1990 and early 1991 with the highest peak month of traffic activity in December 1990. The traffic volumes shown in Figures 4.9 and 4.10 represent the combination of background (baseline) traffic and OWMC generated peak hour demands. The background p.m. peak hour corresponds to the peak generation period for the OWMC plant, while the a.m. peak generation by the plant occurs earlier than the background a.m. peak. For this reason, the analysis of the intersection level-of-service has been restricted to the p.m. peak period.

The p.m. peak construction period produces increased traffic demands on the west leg of the intersection, with very little impact on the other approaches. The existing signal equipment at this intersection has the capability of adjusting the allocation of green time to respond to the vehicle demands on the different legs.

Therefore in assessing the level-of-service at the intersection for the construction period, a reallocation of the signal phase timings has been assumed to equalize the level-of-service on each approach. Table 4.13 presents the results of the intersection level-of-service analysis for the construction p.m. peak period, and compares this with the corresponding baseline conditions from Chapter 3.

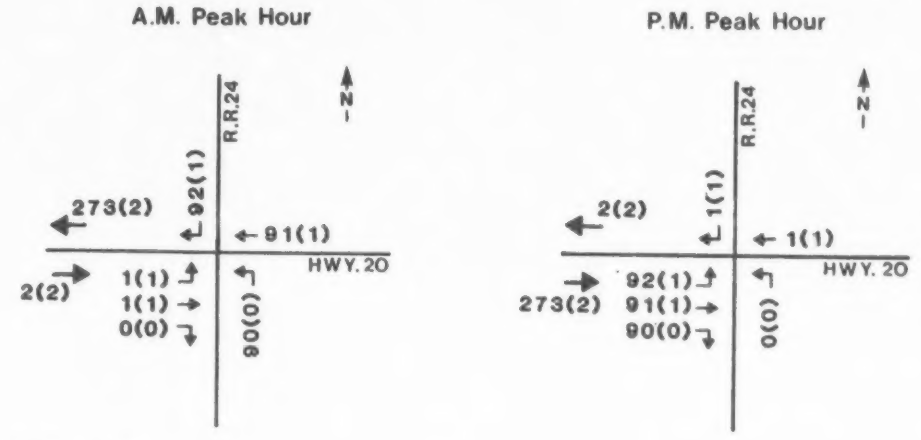
The results of the level-of-service calculation indicate that all legs of the intersection will operate at level-of-service 'A' or 'B' during the peak construction period with a minor adjustment of signal phase timings. This adjustment can be accomplished automatically in that this traffic signal installation is fully actuated and is therefore capable of responding to minor variations in traffic demands.

b) 150 000 tonnes per annum operation period (1995)

During site operations, employment traffic will be significantly lower than during the construction peak period, and as a result the total traffic demands on the north and west approaches are lower than those during construction. Figures 4.11 and 4.12 illustrate the a.m. and p.m. peak hour traffic intersection turning movements for the 1995 operations year.

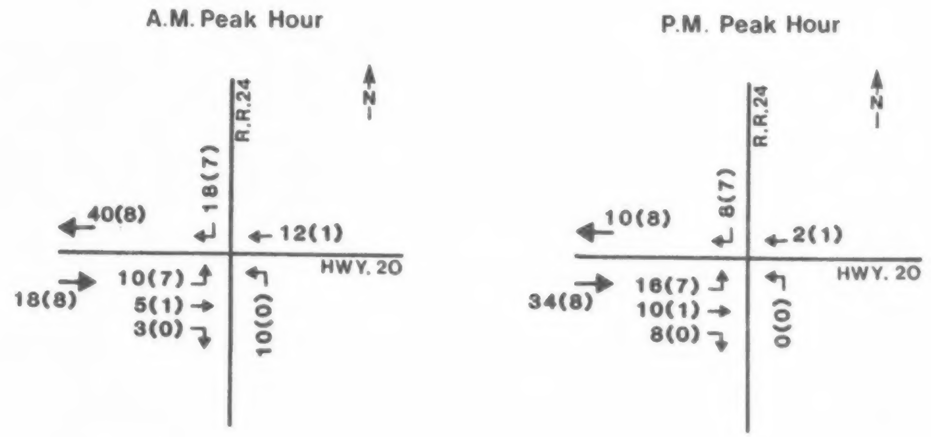
The p.m. peak hour for site operations was selected for the level-of-service analysis. This peak hour was selected because

CONSTRUCTION PEAK PERIOD (Dec.1990)


A.M. Peak Hour
R.R.24
N
273(2)
92(1)
91(1)
HWY. 20
2(2)
1(1)
1(1)
0(0)
90(0)
P.M. Peak Hour
R.R.24
N
2(2)
1(1)
1(1)
HWY. 20
273(2)
92(1)
91(1)
90(0)
0(0)

(x) No. of trucks

150,000 TONNES / ANNUM OPERATIONS (1995)


A.M. Peak Hour
R.R.24
N
40(8)
18(7)
12(1)
HWY. 20
18(8)
10(7)
5(1)
3(0)
10(0)
P.M. Peak Hour
R.R.24
N
10(8)
8(7)
2(1)
HWY. 20
34(8)
16(7)
10(1)
8(0)
0(0)

XX (X)
No. OF TRUCKS
TOTAL VEHICLES

OWMC Ontario Waste Management Corporation

Consultant

DILLON

PHASE 4B
DISTRIBUTION OF OWMC
GENERATED TRAFFIC AT
HIGHWAY 20/ REGIONAL ROAD 24
FIGURE 4:8

1990 WITH OWMC TRAFFIC SURVEY

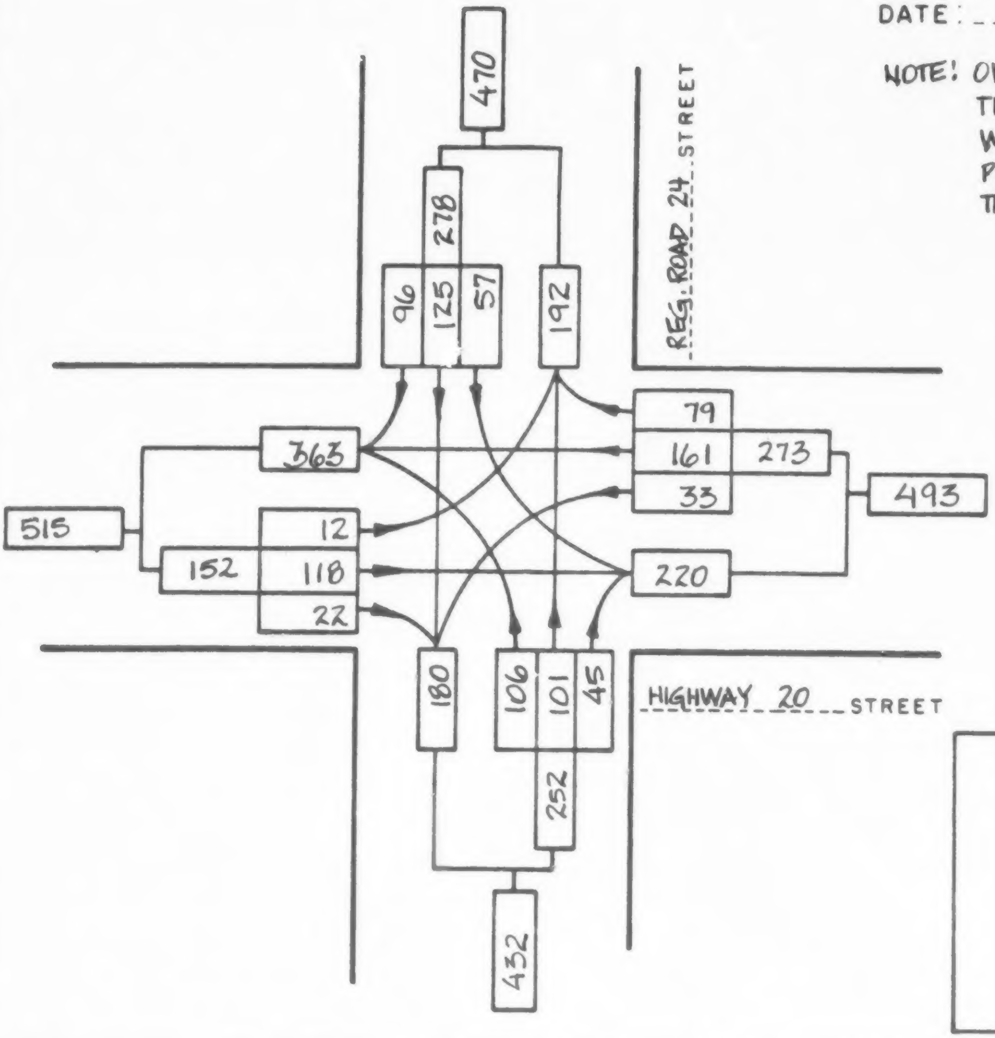
LOCATION REG. ROAD 24 AT HIGHWAY 20

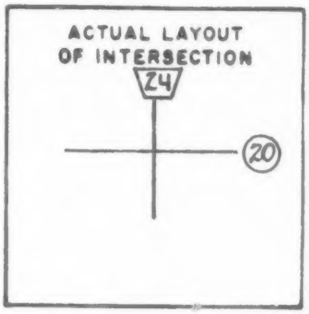
PERIOD AM PEAK HOUR

DAY: S M T W T F S

DATE:

NOTE: OWMC A.M. PEAK TRAFFIC COMBINED WITH 1990 A.M. PEAK BACKGROUND TRAFFIC.


470
278
96
125
57
192
REG. ROAD 24 STREET
79
161
273
33
493
363
515
12
152
118
22
220
180
106
101
45
HIGHWAY 20 STREET
252
432


ACTUAL LAYOUT OF INTERSECTION
24
20

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	57	125	96	106	101	45	12	118	22	33	161	79
		SHORT TRUCKS	8	25	2	3	18	5	1	29	3	3	18	9
		LONG TRUCKS												
		A.M. PEAK												
		P.M. PEAK												
	24 HOUR VOLUME													
	A. A. D. T.													

Figure 4.9

TABLE 4.13
OWMC PHASE 4B - TRANSPORTATION
CHANGE IN P.M. PEAK HOUR LEVEL-OF-SERVICE AT HIGHWAY 20/NIAGARA REGIONAL ROAD 24 DURING CONSTRUCTION PEAK PERIOD (DECEMBER 1990)

	Baseline Level-of-Service[1]		Construction Period Level-of-Service	
Approach Leq	Phase Time[1] (sec)	LOS[2]	Phase Time (sec)	LOS
North:	40	B	38	B
South:	40	A	38	A
East:	36	B	38	B
West:	36	A	38	B

Notes:

1. Assume 90 sec. cycle length with existing clearance timings.
2. From Table 3.6.

1990 WITH OWMC TRAFFIC SURVEY

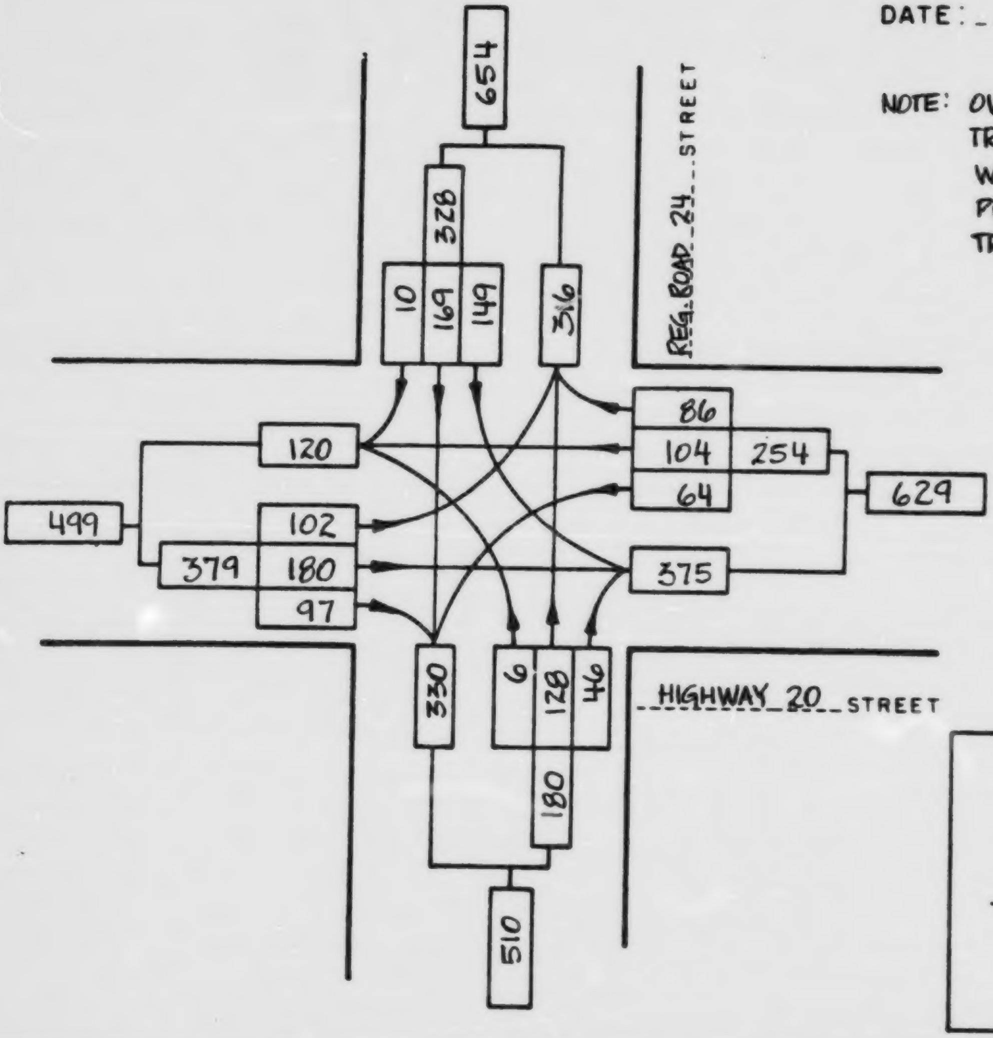
LOCATION REG. ROAD 24 AT HIGHWAY 20

PERIOD P.M. PEAK HOUR

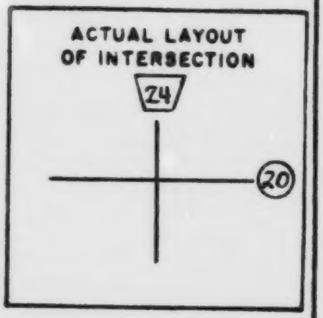
DAY: S. M. T. W. T. F S

DATE:

NOTE: OWMC P.M. PEAK TRAFFIC COMBINED WITH 1990 P.M. PEAK BACKGROUND TRAFFIC.


654
328
10
169
149
316
REG. ROAD 24 STREET
86
120
104
254
64
629
499
102
379
180
375
97
330
6
128
46
HIGHWAY 20 STREET
180
510

N


ACTUAL LAYOUT OF INTERSECTION
24
20

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	149	169	10	6	128	46	102	180	97	64	104	86
		SHORT TRUCKS	21	34	2	1	23	5	2	23	1	5	26	10
		LONG TRUCKS												
		A.M. PEAK												
		P.M. PEAK												
	24 HOUR VOLUME													
	A.A.D.T.													

Figure 4.10

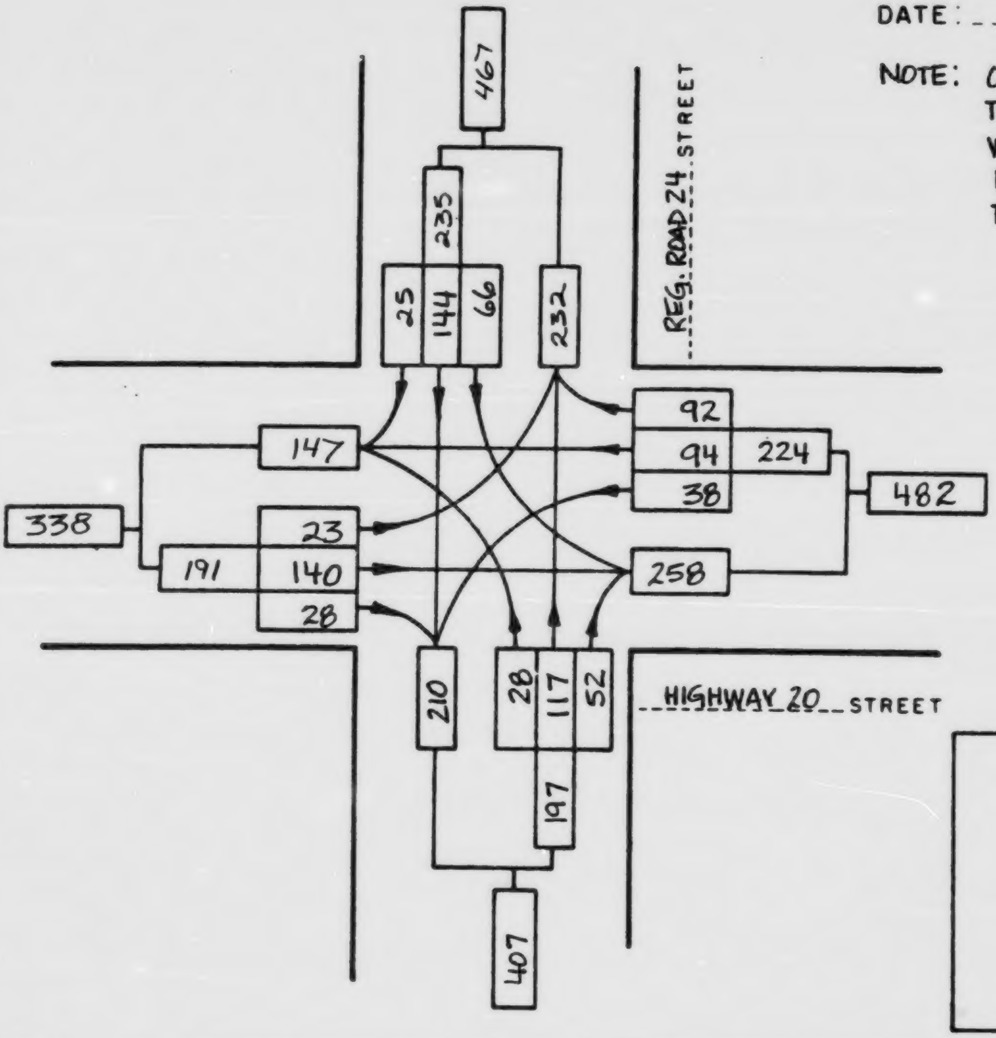
1995 WITH OWMC TRAFFIC SURVEY

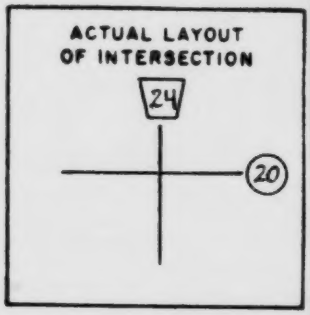
LOCATION REG. ROAD 24 AT HIGHWAY 20

PERIOD A.M. PEAK HOUR

DAY: S. M. T. W. T. F. S.
DATE:

NOTE: OWMC A.M. PEAK TRAFFIC COMBINED WITH 1995 P.M. PEAK BACKGROUND TRAFFIC.


467
235
25
144
66
232
REG. ROAD 24 STREET
92
94
224
38
482
147
338
23
191
140
28
258
210
28
117
52
197
407
HIGHWAY 20 STREET


ACTUAL LAYOUT OF INTERSECTION

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	66	144	25	28	117	52	23	140	28	38	94	92
		SHORT TRUCKS	9	29	8	3	21	5	7	33	3	3	24	10
		LONG TRUCKS												
		A.M. PEAK												
		P.M. PEAK												
	24 HOUR VOLUME													
	A.A.D.T.													

Figure 4.11

this is the time when both the background peak and OWMC peak traffic demands occur. In addition the two critical approach legs of the intersection (i.e. north and east) carry the greatest volume of traffic during the p.m. peak hour. Due to the changes in traffic demands on the north and east legs of the intersection it was necessary to adjust the signal phase timings when estimating the 1995 level-of-service at the intersection. The modified phase timings and resulting levels-of-service are shown in Table 4.14.

The analysis has indicated that the 1995 level-of-service with OWMC generated traffic included remains the same for each leg of the intersection as the 1995 baseline condition. Again, the minor phase time adjustment required should automatically be accommodated by the existing traffic signal controller.

5.5.2 Traffic operations along road sections

The traffic operations along the access route may be impacted by the additional traffic generated by the OWMC facilities. The degree of impact depends upon the magnitude of the additional traffic in relation to the baseline traffic estimated for the two time horizon periods. This section presents a comparison of the baseline traffic volumes with the volumes expected after the implementation of the OWMC facility in terms of both daily, and peak hourly conditions.

Table 4.15 presents a comparison of the baseline AADT with the expected OWMC traffic during an averge work day. Both the construction and 1995 operation condition are presented. This comparison shows that the percent change in traffic volumes are higher during the peak construction month than during 1995 operations. This is largely due to the magnitude of the workforce traffic expected during the peak construction period, and the

TABLE 4.14
OWMC PHASE 4B - TRANSPORTATION
CHANGE IN P.M. PEAK HOUR LEVEL-OF-SERVICE AT HIGHWAY 20/NIAGARA REGIONAL ROAD 24 DURING 150,000 TONNES/ANNUM OPERATIONS (1995)

	Baseline Level-of-Service[1]		Operations Period Level-of-Service[1]	
Approach Leg	Phase Time[2] (Sec)	LOS[2]	Phase Time (Sec)	LOS
North:	40	B	42	B
South:	40	A	42	A
East:	36	B	34	B
West:	36	A	34	A

Notes:

1. Assume 90 second cycle length with existing clearance timings.
2. From Table 3.6.

1995 WITH OWMC TRAFFIC SURVEY

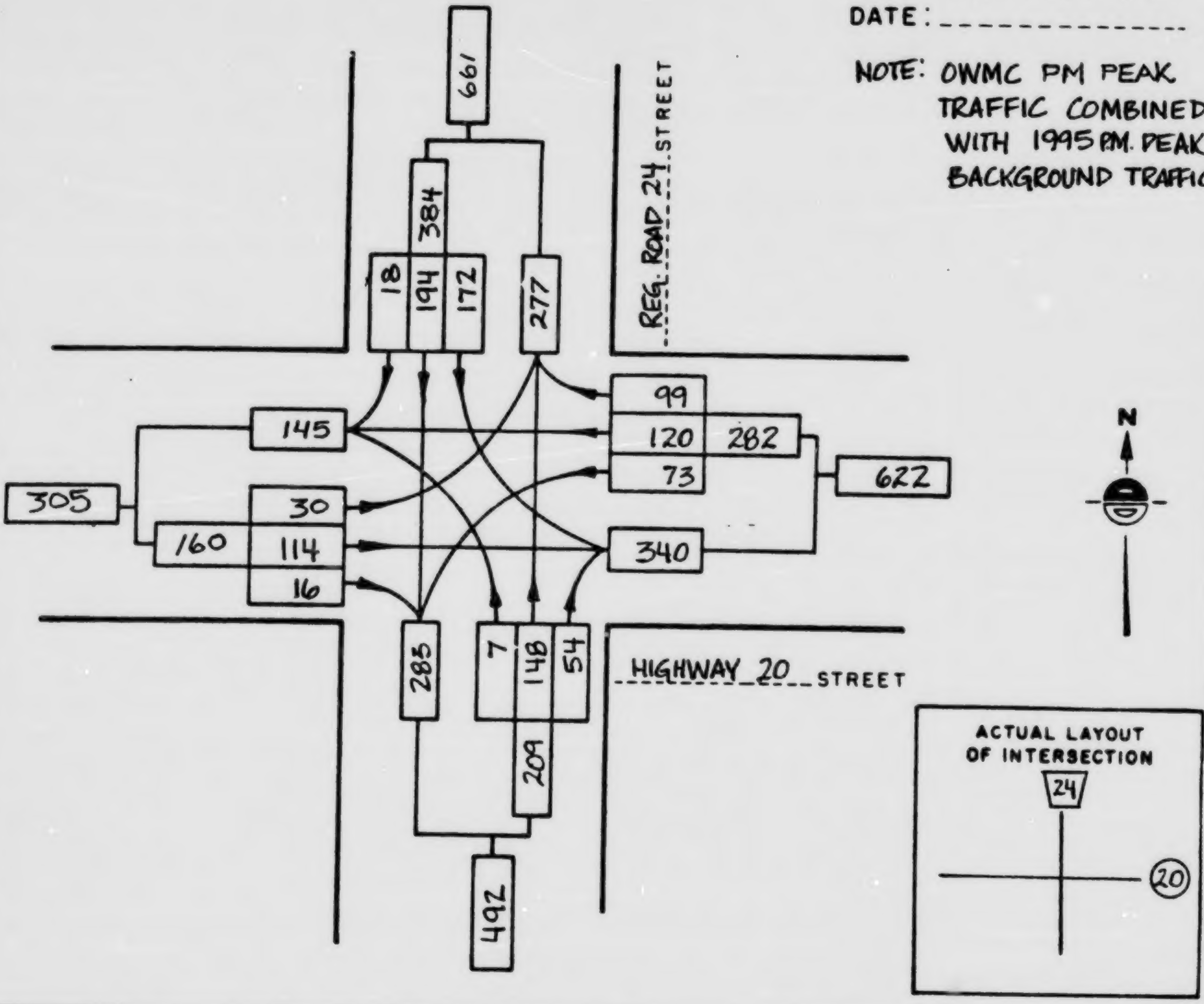
LOCATION REG. ROAD 24 AT HIGHWAY 20

PERIOD P.M. PEAK HOUR

DAY: S. M. T. W. T. F. S.

DATE:

NOTE: OWMC PM PEAK TRAFFIC COMBINED WITH 1995 P.M. PEAK BACKGROUND TRAFFIC.


661
384
18
194
172
277
REG. ROAD 24 STREET
99
120
73
282
622
145
305
30
160
114
16
340
283
7
148
54
209
492
HIGHWAY 20 STREET
N
ACTUAL LAYOUT OF INTERSECTION
24
20

TIME & DATE	ITEM		SOUTHBOUND			NORTHBOUND			EASTBOUND			WESTBOUND		
			LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT
	SURVEY COUNTS	ALL VEHICLES	172	194	18	7	148	54	30	114	16	73	120	99
		SHORT TRUCKS LONG TRUCKS	24	39	8	1	27	5	7	29	6	6	29	11
		A.M. PEAK												
		P.M. PEAK												
	24 HOUR VOLUME													
	A.A.D.T.													

Figure 4.12

TABLE 4.15
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF AADT FOR BASELINE CONDITIONS AND OWMC WORK DAY TRAFFIC ON ACCESS ROUTE

	1990 Construction Daily Volumes (Peak Month)			1995 Operations Daily Volumes[5]		
Link Description	Baseline[1] AADT	OWMC[2] Work Day	% Change	Baseline[3] AADT	OWMC[4] Work Day	% Change
A. Vineland Townline Road (NRR 24)						
1. QEW to NRR 81	9 930	200	2.0	12 140	64	0.5
2. NRR 81 to Moyer	9 160	200	2.2	11 750	64	0.5
3. Moyer to NRR 73	9 160	200	2.2	11 750	64	0.5
4. NRR 73 to Ninth Ave.	7 130	1 154	16.2	8 710	142	1.6
5. Ninth Ave. to NRR 216	6 710	1 154	17.2	7 740	142	1.8
6. NRR 216 to Hwy. 20	5 590	1 154	20.6	6 450	142	2.2
B. Hwy. 20						
1. NRR 24 to Schram Rd.	3 500	1 512	43.2	3 610	368	10.2
C. Schram Rd.						
1. Hwy. 20 to Site	130	1 962	1 509.2	150	532	354.7

Notes:

1. Derived from Table 3.2.
2. Derived from Table 4.1.
3. Derived from Table 3.3.
4. Derived from Table 4.2.
5. Operations employee traffic only considered on Highway 20 and Schram Road.

amount of excess clay to be hauled off site during this time, which will be a short-term impact.

The estimated impacts during peak hour operation are presented in Table 4.16 for both the construction and 1995 operation periods. The operational period peak hour impacts on Regional Road 24 are similar to the daily impacts shown in Table 4.14 ranging from a 0.4% to a 2.2% increase in peak hour traffic; however the short term peak hour impacts for construction are less than for the daily construction traffic impacts, since it is expected that the movement of clay trucks will not correspond to the peak hour traffic on the access road.

The most significant changes in traffic volumes occur along Highway 20 and in particular on Schram Road. The daily volume increases along Highway 20 range between 10.2% during operations to 43.2% during the peak construction month. The changes in peak hour volumes are 14.9% for operation and 71.8% during the peak month of construction. The impact of this change in traffic volumes on Highway 20 has been examined in prior sections of Chapter 4. The previous discussion of impacts on the intersection with Regional Road 24 indicated that there is sufficient spare capacity to accommodate the increased traffic for both construction and operation periods. At the Schram Road intersection, Section 4.2 identified a number of road improvements necessary to accommodate the additional traffic.

5.6 Transportation Costs

M.M. Dillon - Transportation carried out an analysis to update the costs of transportation for special wastes, additives/reagents, and clay/granular material based upon the updated facility assumptions in Phase 4B and updated costing information supplied by Pilorusso Research. These data were supplied to Monenco Limited

TABLE 4.16

OWMC PHASE 4B - TRANSPORTATION

COMPARISON OF PEAK DESIGN HOUR TRAFFIC FOR BASELINE CONDITIONS AND OWMC PEAK HOUR TRAFFIC ON ACCESS ROUTE

	1990 Construction Peak Hour Volumes			1995 Operations Peak Hour Volumes[5]		
Link Description	Baseline[1]	OWMC[2]	% Change	Baseline[3]	OWMC[4]	% Change
A. Vineland Townline Road (NRR 24)						
1. QEW to NRR 81	1 095	99	9.0	1 340	7	0.5
2. NRR 81 to Moyer	1 100	99	9.0	1 410	7	0.5
3. Moyer to NRR 73	1 100	99	9.0	1 410	7	0.5
4. NRR 73 to Ninth Ave.	860	99	11.5	1 050	15	1.4
5. Ninth Ave. to NRR 216	740	99	13.4	850	15	1.8
6. NRR 216 to Hwy. 20	615	99	16.1	710	15	2.1
B. Hwy. 20						
1. NRR 24 to Schram Rd.	380	273	71.8	390	58	14.9
C. Schram Rd.						
1. Hwy. 20 to Site	15	496	3 306.7	15	91	606.7

Notes:

1. Derived from Table 3.2
2. Based on Figure 4.8
3. Derived from Table 3.3
4. Based on Table 4.2; using average truck traffic over 10-hour period.
5. Operations employee traffic considered only on Highway 20 and Schram Road.

for use with their total cost factors related to site assessment. A complete listing of the revised transportation costs are contained in Appendix E.

5.7 Conclusions

The following is a summary of the findings of the transportation risk and impact analyses carried out for Phase 4B site assessment considering construction of the facilities and during the year 1995 when the treatment plant is assumed to process 150 000 t/a of special wastes based on 'typical' operations.

a) The estimated annual spill frequency (accident related and equipment failure) along the access route from the QEW to the site, of potentially hazardous materials are as follows:

Special Wastes - 1 spill every 3.8 years
Additives and Reagents - 1 spill every 25.6 years
Total - 1 spill every 3.3 years

As stated in Section 5.2 only a portion of these spills would pose a risk to human health and the environment (Environ, 1987).

b) It has been estimated that during the period when the site is handling 150 000 tonnes of special waste annually (year 1995) there will be 2.37 OWMC generated vehicles involved in accidents. The components of this total are 1.93 OWMC generated trucks along the total access route, and 0.43 OWMC employee vehicles between the site entrance and Regional Road 24. The total accident involvements by OWMC generated traffic represents a 1.6% increase in the baseline number of accident involvements (145) estimated for the access route in year 1995.

c) The risks to human health associated with OWMC generated vehicle accident involvements has been estimated as one fatal accident involvement every 34.8 years, and one injurious accident involvement every 1.4 years. The combined frequency for both events is one every 1.4 years.

d) The implementation of the OWMC facility results in the need to upgrade the intersection of Schram Road/Highway 20, and to rebuild Schram Road between Highway 20 and Vaughan Road.

e) Between the Schram Road/Highway 20 intersection and the QEW, the OWMC generated traffic can be accommodated within the capacity of the access road and intersections and maintaining a level-of-service of "C" or better, which is an acceptable operating level.

6. RISK AND IMPACT SENSITIVITY ANALYSES OF 150 000 TONNES/ ANNUM HIGH SOLIDIFIED WASTE CASE OPERATIONS

The previous section developed transportation risk and impact values which represented the 'base case' analysis for Phase 4B Site Assessment: 150 000 tonnes per annum capacity, typical treatment scenario. The objective of the analysis presented in this section is to examine the sensitivity of these risks and impacts to short term modifications in treatment processes of the 150 000 tonnes per annum plant capacity. Specifically the sensitivity analyses examines the following high solidified waste case.

6.1 Comparison of Trucking Requirements

This treatment case affects the number of trucks generated by the OWMC facility, but does not alter the number of employees, or the quantity of special wastes vehicles. The high solidified case will increase the number of additive, reagents, and granular trucks arriving and the number of clay haulage vehicles leaving the site. An explanation of the technical differences between the two operating scenerios is provided in the OWMC Site Assessment Phase 4B - Facility Characteristics Report prepared by Monenco Limited, 1987.

The high solidified waste case will increase the number of trucks generated during each year of site operations. Figure 4.13 illustrates the number of one-way annual truck movements generated by the facility each year under typical operation, while Figure 4.14 illustrates the annual trucking requirements for the high solidified waste case.

In each operating case the export of clay materials has been included in the annual generated truck traffic. Since the landfill site is proposed to be excavated on a continuous basis throughout the life of the site, the clay exports reach a "steady state" when the amount of special waste received at the site is constant. This is expected to occur by year 10 of operations.

Both Figures 4.13 and 4.14 show the growth of truck traffic as the amount of waste increases to maximum capacity at year 10. During the latter stages of the site life, the amount of export of clay materials diminishes to zero as the excess clay material is applied as cover on the landfill areas rather than exported for off-site disposal. The background data on annual trucks which were used to produce these figures are tabulated in Appendix G.

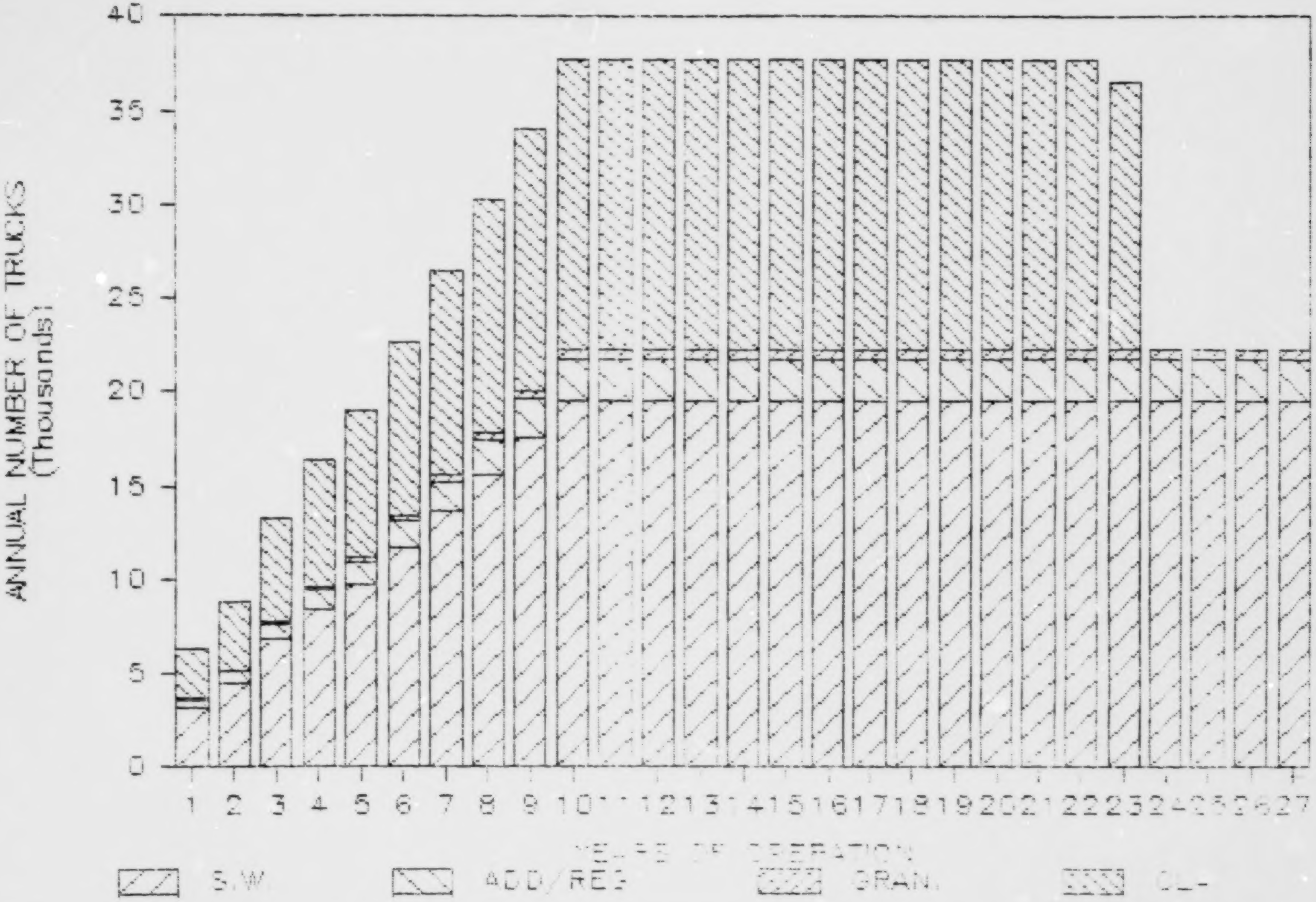
A comparison of the annual and daily vehicle volumes expected at the site entrance for each of the treatment scenerios is presented in Table 4.17. This comparison indicates that the high solidified waste case will produce 31% more annual truck traffic than the typical condition. The following sub-section discusses the sensitivity of the transportation risk and impact factors to these changes in trucking requirements.

6.2 High Solidified Waste Case Sensitivity Analysis

The sensitivity of the transportation risk and impact analysis to the high solidified waste case was carried out in conjunction with the four transportation factors applied to the site assessment process:

- Risk Related:
  - Risks due to Fatal or Injury Accidents Involving OWMC traffic
  - Spill Frequency
- Impact Related:
  - Impact on Traffic Operations Along Access Route
  - Accident Involvement Frequency

To derive the factor values for comparative purposes it is necessary to calculate the annual number of vehicles, spills and accident involvements on a link by link basis. Table 4.18 presents a summary of the spill frequency on the access route, and Table 4.19 presents the accident involvement frequency which reflect the number of trucks required for the high solidified



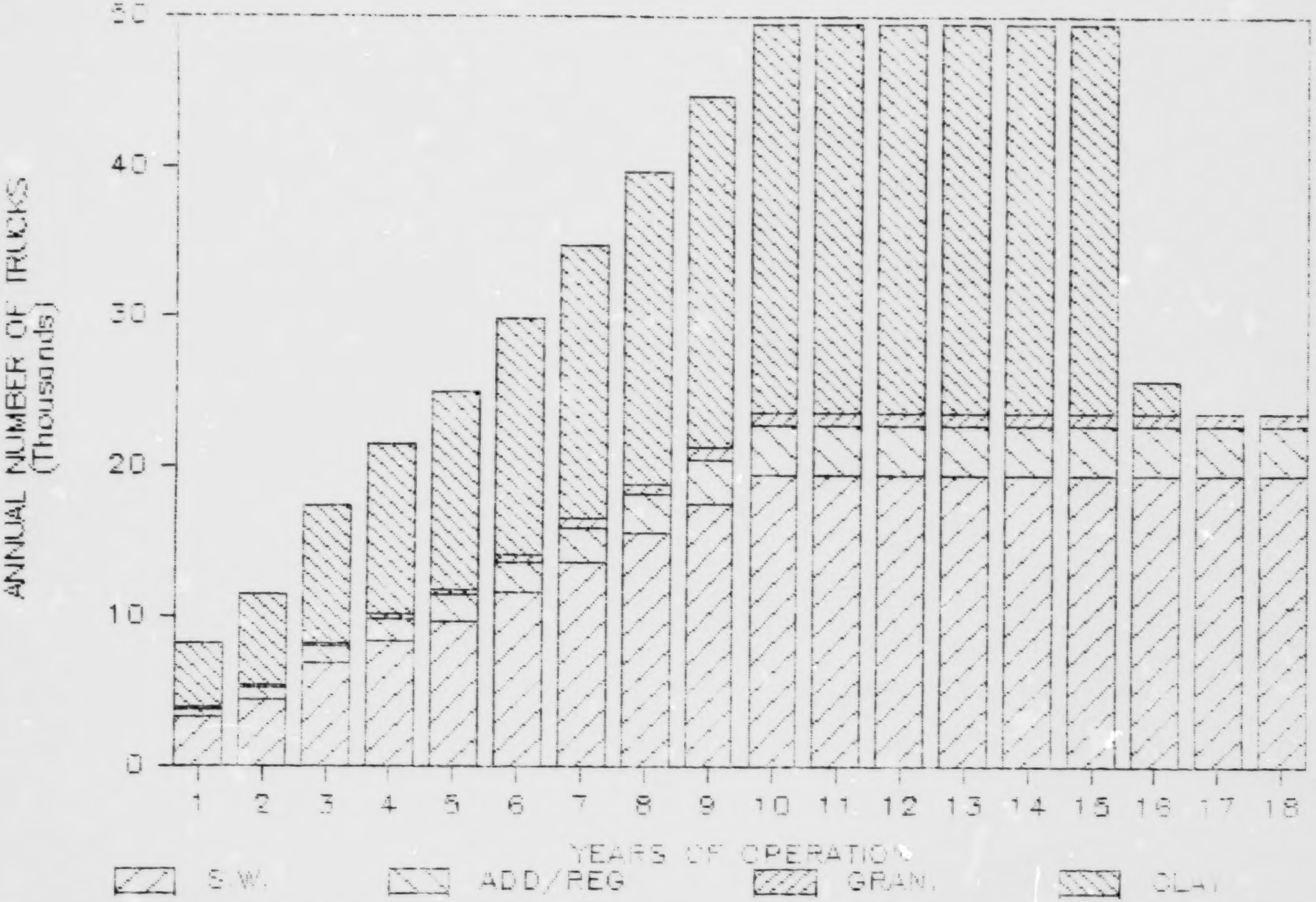
OWMC Ontario Waste Management Corporation

DILLON

PHASE 4B: TRANSPORTATION

ANNUAL TRUCKS - TYPICAL CASE

Figure 4.13



OWMC Ontario Waste Management Corporation

DILLON

PHASE 4B: TRANSPORTATION

ANNUAL TRUCKS - HIGH SOLID CASE

Figure 4.14

TABLE 4.17

OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF VEHICLE GENERATION FOR TYPICAL AND HIGH SOLIDIFIED WASTE CASES AT 150 000 TONNES/ANNUM

	ANNUAL NUMBER OF TRUCKS (ONE-WAY)				WORKDAY NUMBER OF VEHICLES (TWO-WAY)				
Process Case	S.W.	A/R	C/G	Total	S.W.	A/R	C/G	Employ	Total
Typical	9 776	1 134	8 085	18 995	80	10	78	364	532
High Solidified	9 776	1 647	13 404	24 827	80	14	128	364	586
DIFFERENCE	0	+513	+5 319	+5 832	0	+4	+50	0	+54
% Change from: Typical:	0	+45%	+66%	+31%	0	+40%	+64%	0	+10%

LEGEND:

S.W. = special wastes
A/R = additives and reagent materials
C/G = clay and granular materials

TABLE 4.18

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF SPILLS ON THE LOCAL AND REGIONAL ACCESS ROUTE
150,000 t/a OF SPECIAL WASTE - HIGH SOLIDIFIED WASTE CASE

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)	ANNUAL NUMBER OF SPILLS NON ACCIDENT RELATED (3)	ACCIDENT RELATED (4)	TOTAL
A. VINELAND TOWLINE ROAD (RR.24)								
1. QEW to RR. 81	3.8	2.28	Special Wastes	6,550	0.155	0.025	0.015	0.040
			Additives & Reagents	1,600	0.038	0.006	0.004	0.010
			TOTAL	8,150	0.193	0.031	0.019	0.050
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	6,550	0.068	0.005	0.007	0.011
			Additives & Reagents	1,600	0.017	0.001	0.002	0.003
			TOTAL	8,150	0.085	0.006	0.008	0.014
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	6,550	0.014	0.007	0.001	0.009
			Additives & Reagents	1,600	0.003	0.002	.000	0.002
			TOTAL	8,150	0.018	0.009	0.002	0.011
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	6,550	0.174	0.023	0.017	0.040
			Additives & Reagents	1,600	0.043	0.006	0.004	0.010
			TOTAL	8,150	0.216	0.029	0.021	0.050
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	6,550	0.145	0.020	0.014	0.034
			Additives & Reagents	1,600	0.036	0.005	0.003	0.008
			TOTAL	8,150	0.181	0.024	0.018	0.042
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	6,550	0.188	0.027	0.018	0.045
			Additives & Reagents	1,600	0.046	0.007	0.004	0.011
			TOTAL	8,150	0.233	0.033	0.023	0.056
B. HIGHWAY 20								
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	9,776	0.182	0.050	0.018	0.068
			Additives & Reagents	1,615	0.030	0.008	0.003	0.011
			TOTAL	11,391	0.212	0.058	0.021	0.079
C. SCHRAM ROAD								
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	9,776	0.045	0.009	0.004	0.013
			Additives & Reagents	1,647	0.008	0.001	0.001	0.002
			TOTAL	11,423	0.052	0.010	0.005	0.015
ACCESS ROUTE TOTALS	22.2		Special Wastes	9,776	0.971	0.165	0.095	0.260
			Additives & Reagents	1,647	0.220	0.036	0.022	0.057
			TOTAL	11,423	1.191	0.200	0.117	0.317

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the high solidification operation treatment process defined by Monenco Limited, 22 Sept 1986.
2. Derived from all vehicle accident involvement rate using a factor of 1.37.
3. Based on one spill per MVkm..
4. Derived using a conditional probability of 0.196, applied to one-way OWMC annual accident involvment.

TABLE 4.19

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF OWMC TRUCK ACCIDENT INVOLVEMENTS ON THE LOCAL AND REGIONAL ACCESS ROUTE
150,000 t/a OF SPECIAL WASTE - HIGH SOLIDIFIED WASTE CASE

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)
A. VINELAND TOWLINE ROAD (RR. 24)					
1. QEW to RR. 81	3.8	2.28	Special Wastes	6,550	0.155
			Additives & Reagents	1,600	0.038
			Granular & Clay	0	0.000
			TOTAL	8,150	0.193
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	6,550	0.068
			Additives & Reagents	1,600	0.017
			Granular & Clay	0	0.000
			TOTAL	8,150	0.085
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	6,550	0.014
			Additives & Reagents	1,600	0.003
			Granular & Clay	0	0.000
			TOTAL	8,150	0.018
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	6,550	0.174
			Additives & Reagents	1,600	0.043
			Granular & Clay	13,404	0.356
			TOTAL	21,554	0.573
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	6,550	0.145
			Additives & Reagents	1,600	0.036
			Granular & Clay	13,404	0.297
			TOTAL	21,554	0.478
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	6,550	0.188
			Additives & Reagents	1,600	0.046
			Granular & Clay	13,404	0.384
			TOTAL	21,554	0.617
B. HIGHWAY 20					
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	9,776	0.182
			Additives & Reagents	1,615	0.030
			Granular & Clay	13,404	0.249
			TOTAL	24,795	0.461
C. SCHRAM ROAD					
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	9,776	0.045
			Additives & Reagents	1,647	0.008
			Granular & Clay	13,404	0.061
			TOTAL	24,827	0.114
ACCESS ROUTE TOTALS	22.2		Special Wastes	9,776	0.971
			Additives & Reagents	1,647	0.220
			Granular & Clay	13,404	1.348
			TOTAL	24,827	2.539

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the high solidification operation treatment process defined by Monenco Limited, 22 Sept 1986; and export clay quantities M.M.Dillon Ltd., 28 May 1987
2. Derived from all vehicle accident involvement rate using a factor of 1.37.

waste case including the number of granular and clay truck movements.

The following tables present comparisons between the typical and high solidified waste cases for the various transportation factors:

- Annual Spill Frequency - Table 4.20A
- Annual Accident Involvement Frequency - Table 4.20B
- Risk of a Fatal or Personal Injury Accident Involvement - Table 4.21
- Daily and Peak Hour Traffic on Access Route - Table 4.22

On the basis of annual spills of special wastes and additives/reagents, (Table 4.20) the high solidified waste case is likely to produce 6% more spills then the typical operation, amounting to one additional spill of additive/reagent materials every 55.6 years and no change in the frequency of special waste spills. These were not reasoned to be significant changes from the typical operation case.

The total annual frequency of accident involvements by OWMC generated vehicles increases by 26%, or about one accident involvement every two years during the high solidified waste case operation. The majority of this change is due to the additional clay and granular transport vehicle accident involvements which increase by 66%, or one added involvement every 1.9 years. However, the total accident involvements would amount to less than 2% increase to the estimated 145 background accident involvements along the access route in 1995 (Table 4.8).

The total risk of a fatal or personal injury accident involving OWMC generated vehicles (Table 4.21) increases by 27% based on the high solidified treatment process. This translates into

TABLE 4.20

OWMC PHASE 4B - TRANSPORTATION

COMPARISON OF ANNUAL SPILL AND ACCIDENT INVOLVEMENT FREQUENCY FOR TYPICAL AND HIGH SOLIDIFIED WASTE CASES

YEAR 1995 - 150 000 TONNES/ANNUM

A. Annual Spill Frequency

	Annual Spill Frequency on Access Route		Change from Typical	
Material	Typical Operation[1]	High Solid. Oper.[3]	No. Spills	%
Special Wastes:	0.260	0.260	0	0
Additives/ Reagents:	0.039	0.057	+ 0.018	+ 46
Total:	0.299	0.317	+ 0.018	+ 6

B. Annual Accident Involvement Frequency

	Annual Accident Involvements		Change from Typical	
Vehicle Type	Typical Operation[2]	High Solid. Case [4]	No. Acc. Inv.	%
Trucks:				
- Special waste	0.971	0.971	0	0
- Additives/ Reagents	0.149	0.220	+ 0.071	+ 48
- Clay/Granular	0.813	1.348	+ 0.535	+ 66
Total Trucks	1.934	2.539	+ 0.605	+ 31
Employees[5]	0.431	0.431	0	0
Total Vehicles	2.365	2.970	+ 0.605	+ 26

Notes:

1. From Table 4.6.
2. From Table 4.7.
3. From Table 4.18.
4. From Table 4.19.
5. Employee accident involvements from site entrance on Schram Road to Niagara Regional Road 24 only.

TABLE 4.21

OWMC PHASE 4B - TRANSPORTATION

COMPARISON OF RISKS OF FATAL OR PERSONAL INJURY ACCIDENT INVOLVEMENT FOR TYPICAL OPERATION AND HIGH SOLIDIFIED CASE

YEAR 1995: 150 000 TONNES PER ANNUM

	RISK OF FATAL ACCIDENT ACCIDENT INVOLVEMENT		RISK OF PERSONAL INJURY ACCIDENT INVOLVEMENT		TOTAL RISK	
Vehicle Type	Typical Operation^1	High Solid. Case^2	Typical Operation^1	High Solid. Operation^2	Typical Operation^1	High Solid. Operation^2
Trucks	1 every 36.9 years	1 every 28.1 years	1 every 1.8 years	1 every 1.4 years	1 every 1.7 years	1 every 1.3 years
Employees	1 every 580 years	1 every 580 years	1 every 6.7 years	1 every 6.7 years	1 every 6.6 years	1 every 6.6 years
Total	1 every 34.8 years	1 every 26.8 years	1 every 1.4 years	1 every 1.1 years	1 every 1.4 years	1 every 1.1 years
% change from Typical		+ 30%		+ 27%		+ 27%

NOTES:

1. From Table 4.10,
2. Calculated from values in Tables 4.10 and 4.20.

TABLE 4.22
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF TRAFFIC VOLUMES ON ACCESS ROUTE FOR TYPICAL OPERATION AND HIGH SOLIDIFIED WASTE CASE
YEAR 1995: 150 000 TONNES/ANNUM

ACCESS ROUTE	Two-Way OWMC Work Day Traffic		Change from Typical		Two-Way OWMC Peak Hour Traffic		Change from Typical	
Link Description	Typical[1]	High Solid.[3]	Value	%	Typical[2]	High Solid.	Value	%
A. Vineland Townline Rd.								
1. QEW to NRR 81	64	68	+ 4	+ 6	7	7	+ 0	+10
2. NRR 81 to Moyer	64	68	+ 4	+ 6	7	7	+ 0	+10
3. Moyer to NRR 73	64	68	+ 4	+ 6	7	7	+ 0	+10
4. NRR 73 to Ninth	142	196	+54	+38	15	20	+ 5	+33
5. Ninth to NRR 216	142	196	+54	+38	15	20	+ 5	+33
6. NRR 216 to Hwy. 20	142	196	+54	+38	15	20	+ 5	+33
B. Hwy. 20[4]								
1. NRR 24 to Schram Rd.	368	422	+54	+12	58	64	+ 6	+10
C. Schram Rd.[4]								
1. Hwy. 20 to site	532	586	+54	+ 8	91	97	+ 6	+ 7

NOTES:

1. From Table 4.15;
2. From Table 4.16;
3. From Tables 4.19 and 4.2
4. Employee traffic considered only along Highway 20 and Schram Road.

changing the total risk of personal injury and fatal accidents from one every 1.4 years to one every 1.1 years. The risk of a fatal accident increases 30% from one every 34.8 years to one every 26.8 years.

The impact on traffic operations will not change due to the high solidified treatment scenerios (Table 4.22). The additional traffic amounts to a maximum 54 trucks daily, and six trucks during the peak hour. These impacts are reduced north of Regional Road 73 to four trucks daily, and negligible differences in the peak hour. Employee traffic has the largest impact on peak hour operations, and since this component of traffic will not be altered by the high solidified scenario, no significant change in traffic operations is expected at intersections or along the roadways.

6.3 Conclusions

The following conclusions were derived from the sensitivity analyses of the 150 000 tonnes/annum typical operation compared to the high solidified waste case:

a) The total annual trucking requirements for high solidified waste case are 31% greater than for typical, amounting tc an additional 5 832 annual truck movements each way (total of additional, additives/reagents, clay and granular truck movements). However, on a normal workday basis, the increase in trip generation is 10% (54 vehicles/day).

b) In terms of the number of spills of additive/reagents, the high solidified waste case produced 6% more spills than the typical case.

c) The annual accident involvement frequency for OWMC generated vehicles is 26% higher for the high solidified waste case in comparison to the typical case.

d) The total risk of fatal and personal injury accident involvement is 27% higher for high solidified waste case.

e) Changes to the peak hour traffic volume generation for the high solidified waste case were not sufficient to cause any changes in the traffic operations impacts documented for the typical operation.

7. TRANSPORTATION RISKS AND IMPACTS OF 300 000 TONNES/ANNUM PLANT CAPACITY

7.1 Introduction

This section presents the transportation risk and impact data for the 300 000 tonnes/annum special waste treatment typical case. This potential future scenario represents the risks/impacts of an expanded OWMC facility and assumes the expanded facility to be in place by the year 2000.

A comparison of the annual trucking and daily total vehicle generation between the 150 000 tonnes/annum and 300 000 tonnes/annum plant capacities is presented in Table 4.23. The comparison indicates a doubling of special waste and additional additive and reagent trucks, a moderate increase in employment vehicles, and a substantial increase in clay and granular vehicles moving from and to the site, respectively.

7.2 Annual Spill and Accident Frequency

The increased traffic generated by the OWMC facility for the year 2000 would result in increases in spills and accident involvements. Table 4.24 presents the annual spill data for year 2000, and Table 4.25 contains the annual accident involvement frequency for the trucks required at the site. These tables indicate that during the 300 000 tonnes/annum operation there would be 0.597 spills annually of special waste and additive/ reagents or, one spill every 1.7 years. It is also noted that there would be 3.844 annual accident involvements by OWMC generated truck traffic.

7.3 Impacts on Year 2000 Baseline Accident Involvements

The impacts of the 300 000 tonnes/annum plant capacity on the baseline annual accident involvements for year 2000 are shown in Table 4.26. This tabulation indicates that the percent change in accident involvements ranges between 0.7% to 12.8% for the section of the access route beyond Schram Road. The overall change is a 2.6% increase in accident involvements compared to the 1.6% increase expected with the 150 000 tonnes per annum scenario as calculated in Table 4.8.

7.4 Risk of a Fatal or Injurious Accident Involving OWMC Traffic

The risk of an injury or fatal accident involvement by OWMC generated traffic was estimated based on the proportions developed and applied in Section 5 (see Table 4.10). Based on these calculations the following accident risks were derived:

TABLE 4.23
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF VEHICLE GENERATION FOR 300 000 TONNES/ANNUM AND 150 000 TONNES/ANNUM-TYPICAL OPERATIONS

	ANNUAL NUMBER OF TRUCKS (ONE-WAY)				WORKDAY NUMBER OF VEHICLES (TWO-WAY)				
Plant Capacity (tonnes/annum	S.W.	A/R	C/G	Total	S.W.	A/R	C/G	Employ	Total
150 000[1]	9 776	1 134	8 085	18 995	80	10	78	364	532
300 000[2]	19 552	2 243	15 970	37 765	158	18	152	482	810
DIFFERENCE	+9 776	+1 109	+7 885	+18 770	+78	+8	+74	+118	+278
% Change	+100%	+98%	+98%	+99%	+98%	+80%	+95%	+32%	+52%

Notes:

1. From Tables 4.7 and 4.2

2. From Tables 4.25 and 4.3

LEGEND:
S.W. = special wastes
A/R = additives and reagent materials
C/G = clay and granular materials

TABLE 4.24

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF SPILLS ON THE LOCAL AND REGIONAL ACCESS ROUTE
300,000 t/a OF SPECIAL WASTE - TYPICAL OPERATION

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)	ANNUAL NUMBER OF SPILLS NON ACCIDENT RELATED (3)	ACCIDENT RELATED (4)	TOTAL
A. VINELAND TOWLINE ROAD (RR.24)								
1. QEW to RR. 81	3.8	2.28	Special Wastes	13,100	0.311	0.050	0.030	0.080
			Additives & Reagents	2,148	0.051	0.008	0.005	0.013
			TOTAL	15,248	0.362	0.058	0.035	0.093
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	13,100	0.136	0.009	0.013	0.023
			Additives & Reagents	2,148	0.022	0.002	0.002	0.004
			TOTAL	15,248	0.159	0.011	0.016	0.026
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	13,100	0.028	0.014	0.003	0.017
			Additives & Reagents	2,148	0.005	0.002	.000	0.003
			TOTAL	15,248	0.033	0.017	0.003	0.020
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	13,100	0.348	0.046	0.034	0.080
			Additives & Reagents	2,148	0.057	0.008	0.006	0.013
			TOTAL	15,248	0.405	0.053	0.040	0.093
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	13,100	0.291	0.039	0.028	0.068
			Additives & Reagents	2,148	0.048	0.006	0.005	0.011
			TOTAL	15,248	0.338	0.046	0.033	0.079
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	13,100	0.375	0.054	0.037	0.090
			Additives & Reagents	2,148	0.062	0.009	0.006	0.015
			TOTAL	15,248	0.437	0.063	0.043	0.105
B. HIGHWAY 20								
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	19,552	0.363	0.100	0.036	0.135
			Additives & Reagents	2,179	0.040	0.011	0.004	0.015
			TOTAL	21,731	0.404	0.111	0.040	0.150
C. SCHRAM ROAD								
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	19,552	0.090	0.018	0.009	0.026
			Additives & Reagents	2,243	0.010	0.002	0.001	0.003
			TOTAL	21,795	0.100	0.020	0.010	0.029
ACCESS ROUTE TOTALS	22.2		Special Wastes	19,552	1.943	0.330	0.190	0.520
			Additives & Reagents	2,243	0.295	0.048	0.029	0.077
			TOTAL	21,795	2.238	0.377	0.219	0.597

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the typical operation treatment process defined by Monenco Limited, 22 Sept 1986.
2. Derived from all vehicle accident involvement rate using a factor of 1.37.
3. Based on one spill per MVkm..
4. Derived using a conditional probability of 0.196, applied to one-way OWMC annual accident involvement.

TABLE 4.25

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF OWMC TRUCK ACCIDENT INVOLVEMENTS ON THE LOCAL AND REGIONAL ACCESS ROUTE
300,000 t/a OF SPECIAL WASTE - TYPICAL OPERATION

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)
A. VINELAND TOWLINE ROAD (RR.24)					
1. QEW to RR. 81	3.8	2.28	Special Wastes	13,100	0.311
			Additives & Reagents	2,148	0.051
			Granular & Clay	0	0.000
			TOTAL	15,248	0.362
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	13,100	0.136
			Additives & Reagents	2,148	0.022
			Granular & Clay	0	0.000
			TOTAL	15,248	0.159
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	13,100	0.028
			Additives & Reagents	2,148	0.005
			Granular & Clay	0	0.000
			TOTAL	15,248	0.033
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	13,100	0.348
			Additives & Reagents	2,148	0.057
			Granular & Clay	15,970	0.424
			TOTAL	31,218	0.829
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	13,100	0.291
			Additives & Reagents	2,148	0.048
			Granular & Clay	15,970	0.354
			TOTAL	31,218	0.693
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	13,100	0.375
			Additives & Reagents	2,148	0.062
			Granular & Clay	15,970	0.457
			TOTAL	31,218	0.894
B. HIGHWAY 20					
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	19,552	0.363
			Additives & Reagents	2,179	0.040
			Granular & Clay	15,970	0.297
			TOTAL	37,701	0.701
C. SCHRAM ROAD					
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	19,552	0.090
			Additives & Reagents	2,243	0.010
			Granular & Clay	15,970	0.073
			TOTAL	37,765	0.173
ACCESS ROUTE TOTALS	22.2		Special Wastes	19,552	1.943
			Additives & Reagents	2,243	0.295
			Granular & Clay	15,970	1.606
			TOTAL	37,765	3.844

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the typical operation treatment process defined by Monenco Limited, 22 Sept 1986; and export clay quantities M.M.Dillon Ltd., 28 May 1987.
2. Derived from all vehicle accident involvement rate using a factor of 1.37.

TABLE 4.26
OWMC PHASE 4B - TRANSPORTATION
IMPACT ON NUMBER OF ACCIDENT INVOLVEMENTS ON LOCAL AND REGIONAL ACCESS ROAD WITH OWMC OPERATION IN YEAR 2000 - TYPICAL OPERATION

Estimated Number of Accident Involvements/Year

Access Route Link Description	Year 2000[1] Baseline	OWMC Traffic			% Change from Baseline
		Trucks[2]	Employees[3]	Total	
A. Vineland Townline Road (NRR 24)					
1. QEW to NRR 81	47	0.362	-	0.362	+ 0.7%
2. NRR 81 to Moyer	21	0.159	-	0.159	+ 0.8%
3. Moyer to NRR 73	4	0.033	-	0.033	+ 0.8%
4. NRR 73 to Ninth	38	0.829	-	0.829	+ 2.2%
5. Ninth to NRR 216	26	0.693	-	0.693	+ 2.7%
6. NRR 216 to Hwy. 20	28	0.894	-	0.894	+ 3.2%
B. Hwy. 20					
1. NRR 24 to Schram Rd.	9	0.701	0.451	1.152	+12.8%
C. Schram R.					
1. Hwy. 20 to site	<1	0.173	0.123	0.296	>296.0%
Total Access Route	173+	3.844	0.574	4.418	+ 2.6%

Notes:

1. From Table 3.4
2. From Table 4.25
3. Based on annual two-way trips derived from Table 4.3, and the 1983-85 all vehicle accident involvement rate.

Fatal Accident Involvement Risk:

- Trucks - 1 every 18.6 years
- Employees - 1 every 436 years
- Total - 1 every 17.8 years

Personal Injury Only Accident Involvement Risk:

- Trucks - 1.11 every year
- Employees - 1 every 5 years
- Total - 1.3 every year

Total Risk of Fatal and Personal Injury Accident Involvement:

- Trucks - 1.2 every year
- Employees - 1 every 5 years
- Total - 1.4 every year

7.5 Impacts on Traffic Operations along Access Route

The changes in average daily and peak hour year 2000 traffic volumes along the access route between the QEW and the site entrance is representative of the impacts on the year 2000 baseline traffic operation. In the site vicinity, the most critical element of the OWMC generated traffic is the employee traffic movements. The daily volumes and distribution of employee traffic for year 2000 have been presented in Section 4 (see Table 4.3), and the peak hour employee trip generation are presented below:

	A.M. PEAK HOUR			P.M. PEAK HOUR		
	TRUCKS	CARS	TOTAL	TRUCKS	CARS	TOTAL
Inbound:	17	96	113	16	19	35
Outbound:	16	19	35	17	96	113
Total:	33	115	148	33	115	148

Based on these traffic generations, Table 4.27 presents the percent change from year 2000 baseline conditions for each link along the access route in terms of the daily and peak hour traffic. In both cases the largest impacts were experienced in the site vicinity along Schram Road and Highway 20, with decreasing impacts along road section farther removed from the site. On the portions beyond Schram Road the peak hour impacts ranged between +0.8% to +24.0%, by comparison, the peak hour impacts associated with the 150 000 tonnes/annum operation ranged from +0.4% to +14.9%.

7.6 Conclusions

The following conclusions reflect the findings of the transportation risk and impact analyses carried out for the 300 000 tonnes/annum site capacity typical case for the year 2000:

1. The expanded capacity of the OWMC facility by year 2000 will almost double the annual trucking requirements, and increase the work day traffic generations by 52%.

2. The estimate spill frequency of special wastes and additives/reagents is one every 1.7 years.

TABLE 4.27
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF AADT AND PEAK HOUR FOR OWMC WORK DAY WITH BASELINE CONDITIONS ON ACCESS ROUTE
YEAR 2000 - TYPICAL OPERATION

	2000 Operations Daily Volumes			2000 Operations Peak Hour Volumes		
Link Description	Baseline[1] AADT	OWMC[2] Work Day	% Change from Baseline	Baseline Design Hour	OWMC Peak Hour	% Change from Baseline
A. Vineland Townline Road (NRR 24)						
1. QEW to NRR 81	14 830	124	+ 0.8	1 630	13	+ 0.8
2. NRR 81 to Moyer	15 070	124	+ 0.8	1 810	13	+ 0.7
3. Moyer to NRR 73	15 070	124	+ 0.8	1 810	13	+ 0.7
4. NRR 73 to Ninth	10 650	276	+ 2.6	1 280	28	+ 2.2
5. Ninth to NRR 216	8 920	276	+ 3.1	980	28	+ 2.9
6. NRR 216 to Hwy. 20	7 450	276	+ 3.7	820	28	+ 3.4
B. Hwy. 20						
1. NRR 24 to Schram Rd.	3 720	594	+ 16.0	400	96	+24.0
C. Schram Rd.						
1. Hwy. 20 to site	160	810	+506	15	148	+987

Notes:

1. From Table 3.4.
2. From Table 4.3.

3. OWMC generated truck accident involvements were estimated to be 3.84 annually, and employee vehicle involvements to be 0.57 annually, totaling 4.42 annual accident involvements by OWMC generated traffic. This represents an increase of 2.6% over the year 2000 baseline accident involvement on the access route, which was estimated at 173 involvements for year 2000.

4. The total risk of fatal and personal injury accident involvements by OWMC generated vehicles is 1.4 every year. The fatal accident involvement is one every 17.8 years, while the risk of injury accident involvement is 1.3 every year.

5. Impacts on traffic operations are expected to be minimal along all sections of the access route except Schram Road and its intersection with Highway 20 where major modifications will be required to upgrade the intersection and Schram Road.

8. RISK AND IMPACT SENSITIVITY ANALYSES OF 300 000 TONNES/ANNUM HIGH SOLIDIFIED WASTE CASE

8.1 Purpose and Scope

The previous section developed transportation risk and impact values representing the 300 000 tonnes/annum capacity, typical operation. The objective of this analysis is to examine the sensitivity of these risks and impacts to short term modifications in treatment processes of the 300 000 tonnes/annum plant capacity. Specifically, the high solidified waste case will be examined.

In terms of transportation effects, the high solidified waste case will generate additional truck traffic (no change in employment) onto the access roadways due to additional additives and reagents required, and the increased amounts of clay material to export off-site, and granular material to import. Table 4.28 compares the amount of truck traffic generated by the typical operation and high solidified waste cases for the 300 000 tonnes/annum operation. The comparison indicates a 31.4% increase in annual truck traffic for the high solidified waste case, while total workday vehicles would increase by 13.8%.

8.2 Sensitivity Analysis Results

This sensitivity analysis was carried out in the same manner as the 150 000 tonnes/annum analysis described in section 6 of this chapter. The number of trucks as well as the annual spills, and accident involvements were calculated on a link by link basis. Table 4.29 presents a summary of the spill frequency on the access route, and Table 4.30 presents the accident involvement frequency.

The following tables present comparisons between the typical and high solidified cases for the various transportation factors:

- Annual Spill Frequency - Table 4.31A
- Annual Accident Involvement - Table 4.31B
- Risk of a Fatal or Personal Injury Accident Involvement - Table 4.32
- Daily and Peak Hour Traffic on Access Route - Table 4.33

The comparison of annual spill frequencies indicates that the high solidified waste case would produce 6.0% more spills than the

TABLE 4.28

OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF VEHICLE GENERATION FOR
TYPICAL AND HIGH SOLIDIFIED WASTE CASES AT 300 000 TONNES/ANNUM

	ANNUAL NUMBER OF TRUCKS (ONE-WAY)				WORKDAY NUMBER OF VEHICLES (TWO-WAY)				
Process Case	S.W.	A/R	C/G	Total	S.W.	A/R	C/G	Employ	Total
Typical[1]	19 552	2 243	15 970	37 765	158	18	152	482	810
High Solidified[2] Waste:	19 552	3 272	26 804	49 628	158	26	256	482	922
Change from Typical:									
Number Trucks	-	+1 029	+10 834	+11 863	-	+8	+104	-	+112
% Change	-	+45.8	+67.8	+31.4	-	+44.4	+68.4		+13.8

LEGEND:
S.W. = special waste
A/R = additives and reagent material
C/G = clay and granular materials

Notes:

1. From Table 4.23;
2. From Table 4.30.

TABLE 4.29

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF SPILLS ON THE LOCAL AND REGIONAL ACCESS ROUTE
300,000 t/a OF SPECIAL WASTE - HIGH SOLIDIFIED WASTE CASE

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)	ANNUAL NUMBER OF SPILLS NON ACCIDENT RELATED (3)	ACCIDENT RELATED (4)	TOTAL
A. VINELAND TOWLINE ROAD (RR.24)								
1. QEW to RR. 81	3.8	2.28	Special Wastes	13,100	0.311	0.050	0.030	0.080
			Additives & Reagents	3,177	0.075	0.012	0.007	0.019
			TOTAL	16,277	0.386	0.062	0.038	0.100
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	13,100	0.136	0.009	0.013	0.023
			Additives & Reagents	3,177	0.033	0.002	0.003	0.005
			TOTAL	16,277	0.170	0.011	0.017	0.028
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	13,100	0.028	0.014	0.003	0.017
			Additives & Reagents	3,177	0.007	0.003	0.001	0.004
			TOTAL	16,277	0.035	0.018	0.003	0.021
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	13,100	0.348	0.046	0.034	0.080
			Additives & Reagents	3,177	0.084	0.011	0.008	0.019
			TOTAL	16,277	0.432	0.057	0.042	0.099
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	13,100	0.291	0.039	0.028	0.068
			Additives & Reagents	3,177	0.071	0.010	0.007	0.016
			TOTAL	16,277	0.361	0.049	0.035	0.084
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	13,100	0.375	0.054	0.037	0.090
			Additives & Reagents	3,177	0.091	0.013	0.009	0.022
			TOTAL	16,277	0.466	0.067	0.046	0.112
B. HIGHWAY 20								
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	19,552	0.363	0.100	0.036	0.135
			Additives & Reagents	3,208	0.060	0.016	0.006	0.022
			TOTAL	22,760	0.423	0.116	0.041	0.158
C. SCHRAM ROAD								
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	19,552	0.090	0.018	0.009	0.026
			Additives & Reagents	3,272	0.015	0.003	0.001	0.004
			TOTAL	22,824	0.105	0.021	0.010	0.031
ACCESS ROUTE TOTALS	22.2		Special Wastes	19,552	1.943	0.330	0.190	0.520
			Additives & Reagents	3,272	0.436	0.071	0.043	0.113
			TOTAL	22,824	2.379	0.400	0.233	0.633

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the typical operation treatment process defined by Monenco Limited, 22 Sept 1986.
2. Derived from all vehicle accident involvement rate using a factor of 1.37.
3. Based on one spill per MVkm..
4. Derived using a conditional probability of 0.196, applied to one-way OWMC annual accident involvment.

TABLE 4.30

OWMC PHASE 4B - TRANSPORTATION

ANNUAL FREQUENCY OF OWMC TRUCK ACCIDENT INVOLVEMENTS ON THE LOCAL AND REGIONAL ACCESS ROUTE
300,000 t/a OF SPECIAL WASTE - HIGH SOLIDIFIED WASTE CASE

LINK DESCRIPTION	LENGTH (km)	ALL VEH. ACCIDENT INVOLVEMENTS/MVkm 1983-1985	MATERIAL	OWMC ANNUAL ONE-WAY VEHICLE MOVEMENTS (1)	TWO-WAY OWMC ANNUAL ACCIDENT INVOLVMENT (2)
A. VINELAND TOWLINE ROAD (RR.24)					
1. QEW to RR. 81	3.8	2.28	Special Wastes	13,100	0.311
			Additives & Reagents	3,177	0.075
			Granular & Clay	0	0.000
			TOTAL	16,277	0.386
2. RR. 81 to Moyer Rd.	0.7	5.43	Special Wastes	13,100	0.136
			Additives & Reagents	3,177	0.033
			Granular & Clay	0	0.000
			TOTAL	16,277	0.170
3. Moyer Rd. to RR. 73	1.1	0.72	Special Wastes	13,100	0.028
			Additives & Reagents	3,177	0.007
			Granular & Clay	0	0.000
			TOTAL	16,277	0.035
4. RR. 73 to Ninth Ave.	3.5	2.77	Special Wastes	13,100	0.348
			Additives & Reagents	3,177	0.084
			Granular & Clay	26,804	0.712
			TOTAL	43,081	1.144
5. Ninth Ave. to RR. 216	3.0	2.70	Special Wastes	13,100	0.291
			Additives & Reagents	3,177	0.071
			Granular & Clay	26,804	0.595
			TOTAL	43,081	0.956
6. RR. 216 to Hwy. 20	4.1	2.55	Special Wastes	13,100	0.375
			Additives & Reagents	3,177	0.091
			Granular & Clay	26,804	0.768
			TOTAL	43,081	1.234
B. HIGHWAY 20					
1. RR. 24 to Schram Rd.	5.1	1.33	Special Wastes	19,552	0.363
			Additives & Reagents	3,208	0.060
			Granular & Clay	26,804	0.498
			TOTAL	49,564	0.921
C. SCHRAM ROAD					
1. Hwy. 20 to LF-9C	0.9	1.86	Special Wastes	19,552	0.090
			Additives & Reagents	3,272	0.015
			Granular & Clay	26,804	0.123
			TOTAL	49,628	0.228
ACCESS ROUTE TOTALS	22.2		Special Wastes	19,552	1.943
			Additives & Reagents	3,272	0.436
			Granular & Clay	26,804	2.696
			TOTAL	49,628	5.075

Notes: 1. Based upon the Phase 4A, Scenario 2 waste distribution and the typical operation treatment process defined by Monenco Limited, 22 Sept 1986; and export clay quantities M.M.Dillon Ltd., 28 May 1987.
2. Derived from all vehicle accident involvement rate using a factor of 1.37.

TABLE 4.31
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF ANNUAL SPILL AND ACCIDENT INVOLVEMENT FREQUENCY FOR TYPICAL AND HIGH SOLIDIFIED WASTE CASE
YEAR 2000 - 300 000 TONNES/ANNUM

A. Annual Spill Frequency

	Annual Spill Frequency on Access Route		Change from Typical	
Material	Typical Operation[1]	High Solid. Case [3]	No. Spills	%
Special Wastes:	0.520	0.520	0	0
Additives/ Reagents:	0.077	0.113	+ 0.036	+46.8
Total:	0.597	0.633	+ 0.036	+6.0

B. Annual Accident Involvement Frequency

	Annual Accident Involvements		Change from Typical	
Vehicle Type	Typical Operation[2]	High Solid. Case [4]	No. Acc. Inv.	%
Trucks:				
- Special waste	1.943	1.943	0	0
- Additives/ Reagents	0.295	0.436	+ 0.141	+47.8
- Clay/Granular	1.606	2.696	+ 1.09	+67.9
Total Trucks	3.844	5.075	+ 1.231	+32.0
Employees[5]	0.574	0.574	0	0
Total Vehicles	4.418	5.649	+ 1.231	+27.9

Notes:

1. From Table 4.24.
2. From Table 4.25.
3. From Table 4.29.
4. From Table 4.30.
5. Employee accident involvements from site entrance to Niagara Regional Road 24 only; from Table 4.26.

TABLE 4.32
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF RISKS OF FATAL OR PERSONAL INJURY ACCIDENT INVOLVEMENT FOR TYPICAL OPERATION AND HIGH SOLIDIFIED WASTE CASES
YEAR 2000: 300 000 TONNES PER ANNUM

	RISK OF FATAL ACCIDENT ACCIDENT INVOLVEMENT		RISK OF PERSONAL INJURY ACCIDENT INVOLVEMENT		TOTAL RISK	
Vehicle Type	Typical Operation	High Solid. Case	Typical Operation	High Solid. Operation	Typical Operation	High Solid. Operation
Trucks	1 every 18.6 years	1 every 14.1 years	1.11 per year	1.46 per year	1.2 per year	1.53 per year
Employees	1 every 436 years	1 every 436 years	1 every 5 years	1 every 5 years	1 every 5 years	1 every 5 years
Total	1 every 17.8 years	1 every 13.6 years	1.3 per year	1.66 per year	1.4 per year	1.73 per year
% change from Typical		+ 24%		+ 28%		+ 24%

TABLE 4.33
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF TRAFFIC VOLUMES ON ACCESS ROUTE FOR TYPICAL OPERATION AND HIGH SOLIDIFIED WASTE CASE
YEAR 2000: 300 000 TONNES/ANNUM

ACCESS ROUTE	Two-Way OWMC Work Day Traffic		Change from Typical		Two-Way OWMC Peak Hour Traffic		Change from Typical	
Link Description	**Typical[1]**	**High Solid.[2]**	**Value**	**%**	**Typical[1]**	**High Solid.**	**Value**	**%**
A. Vineland Townline Rd.								
1. QEW to NRR81	124	132	+ 8	+6.5	13	14	+ 1	+ 7.7
2. NRR81 to Moyer	124	132	+ 8	+6.5	13	14	+ 1	+ 7.7
3. Moyer to NRR73	124	132	+ 8	+6.5	13	14	+ 1	+ 7.7
4. NRR73 to Ninth	276	388	+112	+40.6	28	39	+11	+39.3
5. Ninth to NRR216	276	388	+112	+40.6	28	39	+11	+39.3
6. NRR216 to Hwy. 20	276	388	+112	+40.6	28	39	+11	+39.3
B. Hwy. 20								
1. RNRR4 to Schram Rd.	594	706	+112	+18.8	96	112	+16	+16.7
C. Schram Rd.								
1. Hwy. 20 to site	810	922	+112	+13.8	148	168	+20	+13.5

Notes:

1. From Table 4.27.
2. From Table 4.30.

typical operations or one more spill of additive/reagents every 27.8 years. This is not reasoned to be a significant change from the typical operation scenario.

The annual accident involvement frequency is 27.9% more for the high solidified waste case than for the typical operation. This translates into 1.23 more accident involvements every year. In comparison to the estimated background accident involvements (173) for year 2000 the shift to the high solidified waste case would increase the OWMC contribution from 2.6% to 3.8% of the accident involvements expected on the preferred access route.

Risk of fatal and personal injury accident involvements by OWMC generated vehicles is increased by 24% from 1.4 per year to 1.73 per year with the high solidified waste case. The fatal accident involvement risk is increased from one every 17.8 years to one every 13.6 years for a net increase of 24%.

The impacts on traffic operations on the links of the access route (see Table 4.33) are also increased with the high solidified waste case. Based upon the change from the typical case for a typical workday, the increase ranges from a low of 6.5% to a high of 40.6%. However, the change in the peak hour of traffic operations is modest in that the high solidified waste case is expected to add one additional truck movement north of Niagara Regional Road 73 and a maximum of 20 truck movements on Schram Road with a smaller increase on road sections in between. Since the employee traffic generation is the greater concern during the peak hour of operations, and does not change for the two waste cases, the change in truck movements does not significantly affect traffic operations on the access route.

8.3 Conclusions

The following conclusions were derived from the sensitivity analysis of the 300 000 tonnes/annum typical operation compared to the high solidified waste case:

1. The total one-way annual trucking requirements for the high solidified case are 31.4% greater than for typical, amounting to an additional 11 863 annual truck movements.

   The total workday vehicle generation two-way to and from the site increases by 13.8% for the high solidified case as compared to the typical case, or 112 additional two-way truck movements per workday.

2. The high solidified waste case produces 6.0% more spills than the typical operation along the access route, or 0.036 more spills per year of additives/reagents.

3. The annual accident involvement frequency for OWMC generated vehicles is 27.9% higher for the high solidified waste case and is almost entirely the result of additional movement of clay and granular trucks.

4. The total risk of fatal and personal injury accident involvements is 24% higher for the high solidified waste case as one more involvement is expected every three years.

5. Changes to peak hour traffic volumes generated for the high solidified waste case are an additional 20 trucks on Schram Road and are not sufficient to cause any changes in the traffic operations impacts documented for the typical case.

CHAPTER 5

MITIGATION

1. INTRODUCTION

1.1 Overview

The purpose, scope, and methodological approach to impact management and potential for mitigation of the impacts associated with OWMC facility operation was addressed in Section 7 of Chapter 2 of this report. Figure 2.1 presented the logic diagram (see Chapter 2) for the approach to be applied by consultants in assessing the risks and impacts and the changes as a result of OWMC facility operation. This chapter, therefore addresses the transportation related change in risks/impacts associated with an OWMC waste management facility, the significance of these changes, and the potential for mitigation of the effects.

It was assumed that the OWMC facility would operate at the initial design capacity level during the year 1995 (assuming Environmental Approval received prior to 1990). Based on this assumption, the baseline for background conditions for the year year 1995 were used to determine the effects of traffic operations without consideration of the OWMC produced change.

Consideration was also given to the operational impacts associated with the full capacity operation of the facility during the year 2000. Baseline conditions for this year were forecasted and the impacts of OWMC expanded operations assessed. Predictions of the 1995 and 2000 baseline conditions were developed in Chapter 3 for the local and regional access route between the QEW and the West Lincoln site. These forecasts are used as the basis for assessing the change in impacts associated with OWMC "typical" operations.

Chapter 4 presents the forecasts of OWMC transport requirements for the operating years 1995 and 2000. The transportation surcharge, as developed in Section 3 (see Table 4.2), predicts the added truck transport and employee travel movements which are expected to occur on the local and regional access road links in 1995. This change, resulting from OWMC site operations, was then applied in Section 5 to assess the impact of this change on baseline conditions in terms of risks and impacts. The transportation surcharge estimated to occur in year 2000, as a consequence of operations under full capacity, was also developed in Section 3 (see Table 4.3) of Chapter 4. The change in impacts associated with these operations were then developed in Section 7. These comparisons provide the framework on which both mitigation needs and requirements are determined, based on the risk and impact factor analyses.

With the exception of site access planning and design and road impact assessment, little information is available to identify the levels of impacts/risks which would warrant the implementation of mitigative measures. Threshold values which differentiate between acceptable and unacceptable risk levels are not established. Since the actual change in risk-related values and frequencies is small (comparing the addition of OWMC traffic generation to future baseline traffic demand), the actual change in values is identified. The percent of change between baseline conditions with and without OWMC operations has then been developed to provide a quantitative statement upon which acceptability can be judged.

To provide a number of benchmarks upon which the acceptability of the OWMC traffic operations surcharge may be judged, an initial analysis was undertaken to demonstrate the change in risk-related values as a result of the growth in background traffic on the local and regional access routes. Thus, this information is calculated for three baseline years of 1986, 1990 and 1995. The need for mitigation based on these comparisons is then assessed.

Similarily, traffic impact thresholds are very broad and many trade-offs are possible when considering desirable levels-of-service on which road improvement needs depend. Consequently, the evaluation and assessment of access road adequacy, both with and without OWMC operations, has identified level-of-service "C" or better to be acceptable and thus, would not require mitigation. This is the level established in the Ministry of Transporation and Communications publication, July 1978, Inventory Manual - Municipal Roads and Structures, (Fourth Printing, January 1982), wherein road section operation at level "C" or better, receives the maximum "conditions" point rating. This threshold may be contrasted with level-of-service "D" or "E" which produces lesser values for the condition point rating, indicating condition deficiencies on the specific road section.

Site access planning and design is an area of analysis wherein good guidelines are available to define mitigative requirements. These are well defined standards and criteria developed by the Ministry of Transportation and Communications, as already discussed and applied to define these requirements in Section 4 of Chapter 4. Residual risks and impacts following the application of mitigative measures have also been identified.

The proposed mitigative needs and future actions for impact management are presented in the following sections. An overall summary of identified transportation concerns and issues associated with OWMC facility operation is presented in Table 5.3.

No mitigation is warranted for the OWMC generated special waste transport occurring on 'other' routes than the define local and regional access route. This concern was addressed in Chapter 4 Section 5.1.1, and it was concluded that the very minor change in traffic volumes (less than 1/2 percent of future baseline traffic) was of very minor significance and will not affect the level-of-service. Consequently, other impacts, risk and risk-related factors would be of even lower significance.

2. RISK-RELATED BENCHMARKS

2.1 Purpose and Approach

The lack of established thresholds of acceptability for risk-related impacts associated with the effects of OWMC facility operations, produces a need to develop a series of benchmarks upon which quantitive judgements may be made. The benchmark values developed for total accident, fatal accident, and injury accident involvements for the baseline analysis years of 1986, 1990, and 1995 (assuming no OWMC facility) may then be compared with similar data develped for OWMC facility operations in the years 1990 and 1995 as set out in Chapter 4. The percent change between benchmark values, with and without OWMC operations, provides a basis for judging the acceptability of the added impact due to OWMC operations.

A somewhat different approach was used in developing spill frequencies for baseline conditions. This was necessary due to a lack of specific background information on spill frequencies and dangerous goods transport on the local and regional access route.

The one-day survey of dangerous goods transport conducted by the transportation consultant on 5 May 1987 (presented in Appendix F) provided a basis for developing an estimate of likely spill frequency. Assuming that the probability of these commodity spills, both accident event related and due to mechanical failure of transport equipment, would parallel those applied to calculate OWMC generated special waste, and additive and reagent spills, it was only necessary to compare this number of transport vehicles.

2.2 Accident Involvements

Table 5.1 displays the historical accident involvements on the local and regional access route from the Niagara Regional Road 24 interchange at the QEW to the site entrance on Schram Road. Between 1983 and 1985, a total of 289 involvements occurred on this 22.2 km section of access route, or an average of 96 involvements per annum. Assuming traffic volume increases for the three baseline years (1986, 1995 and 2000) and a static accident involvement rate per million vehicle kilometers for each of these years, the number of future accident involvements within each year has been estimated both with and without OWMC generated traffic. Based on these estimates it is anticipated that the OWMC volumetric surcharge would result in slightly more than two additional accident involvements in 1995, i.e. a 1.6% increase over the 145 accident involvements that are estimated to occur without OWMC operations.

For the year 2000, the OWMC operations surcharge would result in an additional 4.4 accident involvements which represents a 2.5% increase in the 173 accident involvements forecasted to occur without OWMC operations.

The actual change in frequency of annual accident involvements due to OWMC operations is small and falls within the range

TABLE 5.1

OWMC PHASE 4B - TRANSPORTATION

CHANGE IN ACCIDENT INVOLVEMENTS ON ACCESS ROUTE FOR HORIZON YEARS WITH AND WITHOUT OWMC TRAFFIC GENERATION

Year	Number of Accident Involvements Per Year		Change from 1986 Accident Involvements	
	With OWMC[1]	Without OWMC	With OWMC	Without OWMC
1983[2]	N.A.	110	-	-
1984[2]	N.A.	90	-	-
1985[2]	N.A.	89	-	-
83-85 (average)	N.A.	96	-	-
1986[3]	N.A.	106	-	-
1995[3]	147.4	145	+39.1%	+36.8%
2000[3]	177.4	173	+67.4%	+63.2%

Notes:

1. Based on typical operating case, and includes employee traffic from site entrance to Niagara Regional Road 24.
2. Actual experience values based on recorded accident reports.
3. Estimated accident involvements based on historic involvement rates.

of variance that exists when compared to the actual experience for the years 1983 through 1985. It is also noted that the annual average 1986 to 2000 increase in accident involvements without OWMC operations is estimated at 4.51, and 4.81 with OWMC operations. Thus, it may be concluded that OMWC operations would have a very minor impact on accident involvement frequencies and has a low significance.

2.3 Accident Involvement Risk

Table 5.2 presents a somewhat similar comparison to Table 5.1 except that it deals only with those accident involvements that pose a risk to human health by way of fatal or injurious accident involvements. Thus, accident involvements that produce only monetary effects (property damage) are ignored.

Comparing the year 1995 to 1986, and assuming no OWMC traffic generation, it is forecast that there will be a 33.3% increase in the combined risk of fatal and personal injury accident imvolvements. This change is a result of an increase in exposure, due entirely to an increase in vehicle usage, along the access route. It was calculated that 52 fatal and injury accident involvements would occur in 1995 as opposed to 39 in 1986. When OWMC generated traffic volumes are surcharged to the 1995 background traffic, less than one additional fatal and injurious accident involvements was estimated to occur in 1995. Thus the combined increase in these accident involvements over 1986 is 1.8% (35.1% - 33.3%). As shown in Table 4.11, the addition of OWMC traffic volumes to the access route in 1995 would produce one additional fatal and injury accident involvement every 1.4 years.

Similar results are noted for the change with and without OWMC operations for the horizon year 2000. The marginal change is

TABLE 5.2

OWMC PHASE 4B - TRANSPORTATION

CHANGE IN ESTIMATED RISK OF FATAL AND PERSONAL INJURY ACCIDENT INVOLVEMENTS ON ACCESS ROAD FOR HORIZON YEARS WITH AND WITHOUT OWMC TRAFFIC OPERATIONS

Year	Number of Accident Involvements Per Year			Change from 1986 Accident Involvements		
	Fatal	Injury	Combined	Fatal	Injury	Combined
1986 (estimate)	1	38	39	N.A.	N.A.	N.A.
1995:						
- with OWMC	1	51.7	52.7	0%	+36.0%	+35.1%
- without OWMC	1	51	52	0%	+34.2%	+33.3%
2000:						
- with OWMC	1	62.2	63.3	0%	+63.7%	+62.3%
- without OWMC	1	61	62	0%	+60.5%	+59.0%

3.3% for year 2000 with the OWMC traffic surcharge (62.3% - 59.0%). This difference is the result of 1.3 additional fatal and injurious accident involvements (63.3 - 62) in year 2000 due to OWMC operations.

2.4 Spill Frequency

Spill frequency of special wastes, and additives and reagents for the year 2000, when the OWMC is assumed to be processing 300,000 t/a of special wastes - typical operation, was developed in Section 7 of Chapter 4. The combined frequency calculated for both non-accident related and accident related spills was estimated at 0.597 spills in the year 2000 (1 spill every 1.7 years) on the 22.2 km length of the local and regional access route.

The potential for a major spill is higher for those that are accident related, e.g. ruptures of a tank container in a collision, vehicle overturn causing loss of load, etc.; as opposed to non-accident related spills resulting from the failure of a transport vehicle component, e.g. leaky valve, overflow through venting system, etc. Therefore, the more appropriate spill frequency of potential concern is 0.219, or 1 spill every 4.6 years as a consequence of a motor vehicle accident involvement on the access route. The remaining spill frequency of lesser concern, due to equipment failure, is 0.377, or 1 every 2.7 years.

The risk consultant (Environ Corporation 1987) undertook a review of the waste types expected to be received at the OWMC treatment facility to determine the quantity of wastes which could produce harmful effects if the contaminants spilled on a road were inhaled. This analysis indicated that approximately 8% of the wastes transported would pose a potential risk to human health through the air pathway if a spill occurs. Thus, it may be concluded, based on the 8% quantity figure, that the motor vehicle accident related spill frequency for potentially harmful waste is 1 spill every 65.8 years (1 ÷ 0.190 x 0.08).

The transportation consultant used a special analysis of the additives and reagent materials required for waste treatment. From this it was determined that approximately 60% of the materials transported by truck were classifed as dangerous goods. While the overall accident related spill frequency for all additives and reagents was 1 every 34.5 years, the frequency for the dangerous goods component alone is 1 spill every 57.5 years.

2.5 Summary and Conclusions

Section 2 of this chapter was prepared to provide a basis for assessing quantitatively the risk-related impacts of OWMC operations on the local and regional access route from the Niagara Regional Road 24 interchange at the QEW to the Preferred Site entrance on Schram Road. The rationale for this approach was to provide benchmarks, where possible, so that judgements could be made as to the acceptability of these impacts as no thresholds of acceptability are established.

In dealing with accident involvement impact, comparisons are made between the number of involvements estimated to occur with and without OWMC site operation for the horizon years 1995 and 2000. For the year 2000, it is estimated that 173 access route accident involvements would occur without OWMC traffic operation. OWMC operations in that year is estimated to add 4.4 involvements - a 2.6% increase. This change is reasoned to be acceptable and is considered to be of low significance, in that the increase in background traffic accident involvements (without OWMC traffic generation) between 1986 and 2000 is estimated at 67 (173 - 106). The increase over the 14-year period is 36.8%, or an average of 2.6% increase each year. Consequently the 2.6% increase resulting from full capacity OWMC operations is approximately equivalent to a one-year growth in background traffic accident involvement.

A similar approach was applied to deal with the changes in risk of fatal and injurious accident involvements on the access route. A 1986 base was developed and forecasts of future risk were made for the horizon years 1995 and 2000 with and without an OWMC facility in place.

For the year 2000 horizon, it was calculated that 62 fatal and injurious accident involvements would occur on the access route without an OWMC facility. This represents a 59% increase over the 1986 benchmark value of 39 involvements. With the increase in transport on the route as a consequence of OWMC traffic generation, it was estimated that 63.3 fatal and injury accident involvements would likely occur. When compared to the 1986 benchmark, the overall fourteen year increase is 62.3%, which may be compared to the 59% increase calculated for background traffic alone. The difference in these values is small amounting to 3.3% and results from the difference of 63.3 versus 62 fatal and injury accident involvements.

It was reasoned that the change in risk due to OWMC generated traffic operations producing an additional 1.3 fatal and injury accident involvements in the horizon year 2000 was of low significance. The rationale for this statement is that the annual average change in risk each year on the access route between 1986 and 2000 is an increase of 1.6 fatal and injury accident
Thus, it is seen that the addition of OWMC generated traffic on

the route would have a smaller impact than that incurred each year as a result of the growth in background traffic risk.

Spill frequency expected to occur on the access route is low. As noted in section 2.4, the combined frequency of both accident related and non-accident related spills was 1 spill every 1.7 years for all transport vehicle movement of special wastes, and additives and reagents when the OWMC facility is operating at the design capacity for processing 300 000 t/a of special waste. It was concluded that only a portion of these spills would pose a risk to human health or the environment. This was based on the consideration that the potential for a major spill is accident related and the frequency of this is 1 spill every 4.6 years.

Based on the risk analysis investigations conducted by Environ Corporation, it was concluded that the frequency of a significant spill (as a result of a motor vehicle accident) posing a risk to human health and/or the environment was approximately 1 spill every 50 years or more. In that such frequency exceeds the expected operating life of the OWMC facility, it was concluded that spill risk has a low significance.

Based on the conclusions developed from the analysis of risk related items, some opportunities for mitigation do exist within the following areas:

- assist in driver training/certification with specific reference to OWMC truck transport;

- assist in the development of emergency response training and contingency planning (further details are presented in the OWMC Environmental Assessment - Site Assessment Volume);

- institute on-site transport vehicle inspection to detect faulty equipment; and

- compile vehicle exposure statistics and exchange data with safety officials so that mitigative actions can be taken with respect to inordinately frequent adverse events by individual haulers.

3. ACCESS ROUTE IMPACTS

3.1 Site Entrances

Primary site access is to be provided from the Schram Road frontage which forms the easterly boundary of the site. A total of four access points were defined to properly integrate external movements with internal operations (see Chapter 4, Section 4.1, and Appendix D).

To mitigate the traffic impacts associated with OWMC operations on Schram Road and at each of the four site entrances, the specific design requirements have been identified as summarized below:

a) Upgrade Schram Road to a two-lane Class A road with a paved width of 7 m and 2 m shoulders each side. This includes pavement base strengthening to accommodate heavy trucking and drainage structure improvement, as may be required.

b) Three truck transport entrances with entrance taper are to be provided. The entrance design to be equivalent to MTC truck access standard CS-19.

c) One employee/visitor site entrance to be provided equivalent to MTC truck access standard CS-19 without entrance taper.

The improvements proposed require approval by the Township of West Lincoln as they have jurisdiction over Schram Road and entrance permits are required. Any refinement to the design requirements proposed should be made in consultation with the Township.

The engineering consultant (Monenco Limited) has defined a need for an emergency services entrance to the site and proposes that this be located on the Highway 20 frontage. The design proposed is for an MTC access design CS-22 or equivalent. Approval of the entrance type and location is under the jurisdiction of MTC. Consequently, consultation with this Ministry is required to secure all aprovals.

The inclusion of the proposed road improvement and access provisions is appropriate to mitigate the impacts associated with immediate site access in terms of roadway operations and safety. Since no need was identified to acquire additional private property for the design accommodation noted, no additional impacts are expected.

3.2 Highway 20/Schram Road/Silverdale Road Intersection

The anticipated problems associated with this existing intersection, based on the use of Schram Road as the primary site access route, were addressed in Section 4.2 of Chapter 4. Two intersection improvement options were proposed for evaluation by OWMC and one will be selected in consultation with the Ministry of Transportation and Communications and the Township of West Lincoln, who have joint jurisdiction over this intersection. From the transportation perspective, the designs and resulting operations of both options are identical.

The selection of an option followed by implementation prior to the construction of the OWMC waste treatment facility, would mitigate to a reasonable level the transport impacts associated with use of this intersection. The recommended geometric design features associated with the proposed improvements meet the standards and criteria associated with intersection design requirements for King's Highways.

3.3 Traffic Impacts on the Local and Regional Access Route

The traffic impacts associated with OWMC operations on the local and regional access route were addressed in Chapter 4, Section 5.5. These were considered on each of the eight road links that form the access route from the QEW to the Schram Road site entrances, and at the Highway 20/Niagara Regional Road 24 intersection. No special analysis was undertaken for the Niagara Regional Road 24/81 intersection, including OWMC traffic operations, as the added traffic volumes due to OWMC operations were too small to influence and change the 1995 baseline levels-of-service forecast.

This discussion deals with mitigation of the impacts on OWMC generated traffic on the operations of the access road. The noise related impacts of this traffic, and the associate mitigation is discussed in the S.S. Wilson and Associates 1987 report Site Assessment Phase 4B - Noise.

The facility construction is expected to take place during an eighteen month period during 1990 and 1991 (assuming Environmental Assessment Hearings are completed prior to 1990). During this time the OWMC generated daily two-way traffic volumes at the site entrance will vary from 1184 to 1962 vehicles, and along Highway 20 east of Schram Road the traffic volume will range from 474 to 1512 two-way vehicles per day.

A large proportion of this traffic is associated with the construction work force. The largest traffic impact is expected during the six months from September 1990 to February 1991 during which time the work force vehicle component of the daily two-way traffic ranges from 814 to 986, representing 45% to 50% of the total daily traffic volume. This work force traffic is expected to arrive/ depart during the peak hours as construction forces start and end work. The remaining traffic is expected to be spread over the remaining 8 to 10 hour period of daily construction.

Since the impacts of the construction phase are expected to be short term they do not carry as much importance as the longer term impacts associated with the operations period. However, the measures to be applied at the intersection of Schram Road/ Highway 20 will be sufficient to address the impacts of the construction period.

3.3.1 1995 (2000) traffic volume on road links

Two comparisons were made to identify the potential need for mitigation:

- at the 1995 (2000) design hour/peak hour level; Table 4.16 (4.27), and

- at the 1995 (2000) AADT/normal workday level; Table 4.15 (4.27)

On the six Niagara Regional Road 24 links during the peak hour, the percent volume change resulting from OWMC operation ranged from 0.5% (0.8%) to 2.1% (3.4%). Measured in added number of vehicles per hour to baseline conditions the range is 7 (13) versus 1,340 (1,630) to 15 (28) versus 710 (820). This is viewed to be an almost inperceptable change to baseline volumes. The results are similar when assessed on a 1995 (2000) total daily basis. The range in percent change is 0.5% (0.8%) to 2.2% (3.7%). Again, measured in added daily number of vehicles the range is 64 (124) versus 12,140 (14,830) to 142 (276) versus 6,450 (7,450).

These levels of change in traffic volumes are so small that they have no measurable effect on roadway level-of-service. All road sections would continue to operate at level "C" or better.

3.3.2 1995 (2000)impacts at Highway 20/Niagara Region Road 24 intersection

The Highway 20/Niagara Regional Road 24 intersection was assessed in terms of the 1995 (2000) baseline and OWMC generated traffic surcharge at the intersection for the highest daily peak hour (p.m. peak). The results of this analysis demonstrated that each of the four intersection approaches would continue to operate at levels "A" or "B". The only change required at this signalized intersection is a slight shift (4 seconds) in signal phase time allocation (from east/west to north/south). This may be considered to be a very minor mitigation measure; however, as this signalized intersection is normally operated in the fully actuated mode, it is likely that this adjustment in phase time allocation would be made internally by the signal controller.

3.3.3 1995 (2000) accident involvement impacts on access road links

The expected change in the annual frequency of accident involvements on each access road link, as a result of OWMC operations during the year 1995 (2000), was calculated to determine the impact on predicted 1995 (2000) baseline conditions. This comparison is made in Table 4.7 (4.26) of Chapter 4.

Section 2.2 of this chapter and Table 5.1 provides details on the change in accident involvement impacts associated with the OWMC operations at both the 1995 and 2000 operating levels.

It is evident that the added accident involvement impact due to OWMC operations will be very minor within the overall context of total all-vehicle accident involvements expected to occur on the access route system. As it was also concluded in the analysis of accident event occurrence on the access route over the period 1983 through 1985 (see Appendix B), that the system was relatively safe, no potential mitigative measures could be identified. However, it was noted that four sections along Niagara Regional Road 24 displayed a somewhat higher incidence of accident occurrence during inclement weather, i.e. rain, fog or snow. Based on more detailed analysis, six specific locations were identified that appear to warrant ongoing monitoring by the Regional Municipality of Niagara to determine if some form of mitigation would be beneficial to the improvement of road safety on this route.

The relative safety of the access route can be demonstrated through a comparison of the accident rates on the access route to the provincial averages from 1983 to 1985. Table B.3 in Appendix B indicates that the accident rate for the total access route is 1.44 accident events per million vehicle kilometers. On the Highway 20 portion of the route the rate is 0.94 accident events per million vehicle kilometers. The Ontario Ministry of Transportation and Communications publication Traffic Volumes - 1985 indicates that during the same time period (1983 - 85) the accident rate for Provincial Secondary Highways ranged from 1.3 to 1.5, for King's Highways it ranged from 1.0 to 1.2, and for all highways it ranged from 0.9 to 1.0, and for all roads in the province the accident rate ranged from 2.8 to 2.9 accident events/ million vehicle kilometers. This comparison indicates that the accident rates on the access route are lower than the provincial average, and similar to those of the secondary highways. Furthermore, the accident rate on Highway 20 is lower than the average of all King's Highways in the province.

3.4 Summary and Conclusions

Section 3 of this chapter has given consideration to the degree and change in impacts associated with OWMC operations on the local and regional access route and the type of mitigation recommended for application. These analyses were based on what has been defined as 'typical' operations at the OWMC waste treatment facility during the year 1995 (2000) when it is anticipated that the facility would be operating at design capacity of 150 000 t/a (300 000 t/a) of special waste treatment. Sensitivity analyses were presented in Section 6 (Section 8) of Chapter 4 for the high solidified waste case. These were omitted from the impact assessment for mitigation, as it represents short term operations impacts. Typical operation is deemed to be representative of a longer term period, i.e. one year or longer, and therefore includes the less frequent occurrence of the 'high solidified' operating case.

The following summary conclusions identify the transportation impact mitigative requirements associated with OWMC operations:

a) Schram Road should be upgraded to provide a paved two-lane road cross section with widened shoulders and a suitable pavement structure to support the design vehicle loadings anticipated. The purpose of this mitigative measure will be to provide an acceptable access for the OWMC generated traffic with a minimal inpact on other road users (including farm vehicles). The proposed road design would also permit the construction of four site entrances from Schram Road into the OWMC facility. Three of these are to be designed to accommodate truck transport movements and the fourth, employee/visitor passenger vehicles. The design requirements for these entrances and the roadway has been identified but must be confirmed and approved by the Township of West Lincoln.

b) One emergency site entrance is required and is proposed to be located at the north property boundary connecting to Highway 20. The design requirements for such an entrance have been identified. The final details for design and access approval will require that an access application be made to the Ministry of Transportation and Communications.

c) Existing design standards and criteria for intersections with a King's Highway requires the modification and upgrading of the existing intersection of Highway 20/ Schram Road/Silverdale Road, so that Schram Road can safely accommodate OWMC generated traffic demands. The design requirements for the improved intersection have been identified and a specific design is to be selected by OWMC in consultation with the Ministry of Transportation and Communications and the Township of West Lincoln who jointly have jurisdiction over the roadways involved.

d) The traffic volume surcharge (impact) resulting from OWMC operations on the balance of the defined access route, is of such a minor nature that no mitigative measures are warranted.

e) The change in predicted annual accident involvements (impact) by OWMC operations on the defined route, are insufficient to warrant the application of mitigative measures.

f) Within the analysis time frame, the impact of growth of the baseline traffic volumes on the access route (with and without OWMC generated traffic), was insufficient to define mitigative needs beyond those identified.

g) The OWMC has proposed an outline for an emergency response plan to deal with the potential spillage of materials on the access route. This plan is discussed in more detail in the 1987 Report by M.M. Dillon Limited, OWMC Environmental Assessment - Site Assessment Volume.

h) The mitigative measures associated with the noise impacts resulting from the OWMC generated traffic, are discussed in the report S.S. Wilson and Associates, 1987, Site Assessment Phase 4B - Noise.

4. RESIDUAL RISKS AND IMPACTS

4.1 Highway 20/Schram Road Intersection

Based on the forecasts of vehicle turning movements to occur between Highway 20 and Schram Road, as a result of the OWMC site construction and operations, mitigation is required to accomodate the left and right turning movement volumes at the intersection. The applications of this mitigative measure produces significant benefits and minimizes potential conflicts between background traffic movement and the OWMC generated traffic movement. The following points summarize the benefits/minimization of potential conflicts:

- provision of the separate left turn deceleration and storage lane on Highway 20, eliminates the potential for delay to westbound through traffic on Highway 20 and rear end collisions;

- provision of the channelized right turn lane and the acceleration lane for movements from south to east, minimizes the potential for delay to eastbound through traffic and rear end collisions;

- removal of the adverse offset between the existing Silverdale Road and Schram Road intersections with Highway 20, provides the opportunity to accomodate a left turn lane for movements from west to north which in turn minimizes the potential for delay to eastbound through traffic on Highway 20 and rear end collisions.

Thus it is seen that benefits will accure to through traffic operations and that left turning movements both eastbound and westbound will be accomodated more safely by the elimination of potential rear end collisions.

While this mitigative measure promotes the avoidance of through traffic delay and the potential for rear end collisions, the increase in left and right turning movements between Highway 20 and Schram Road increases the potential for right angle and side swipe collisions. This is deemed to be a residual risk related effect. However, while this potential remains, it is to be noted that the mitigative measure applied is a standard traffic and highway engineering design and minimizes the risk associated with turning movements between intersecting roadways.

The impacts associated with this location is directly related to the increase in traffic volumes on Highway 20 as a result of the OWMC traffic generated movements. While the increase in traffic volume will have little effect on traffic operations with or without OWMC (10.2% increase in total traffic volumes in 1995 and 16% increase in year 2000), the total resulting volume (3 978 in 1995 and 4 314 in 2000) on Highway 20 east of the site, would have negligable impact. This increase is however, a residual impact and is not mitigatible.

4.2 Schram Road

Improvements were recommended to occur on Schram Road between Highway 20 and Vaughan Road. This mitigative action included the widening of the roadway to provide a paved two-lane cross-section with widened shoulders. Paved entrances to the site at four locations are also proposed, subject to the approval of the Township of West Lincolin.

The residual impact of OWMC traffic operations on Schram Road is not directly mitigatible as there is a significant increase in road use. However, background traffic and OWMC generated movements on the route will benefit as the result of a high quality paved surface to replace the existing gravel surface. This would reduce both road noise and dust generation along the route. Furthermore, the widened roadway and provision of shoulders would produce a more satisfactory accomodation of agricultural vehicle movements along this route.

Widening and paving of Schram Road is anticipated to reduce the risk of accident involvements on the route. However, the reduction is not viewed to be meaningful in that less than 1 accident per year was estimated to occur based on existing and estimated future traffic levels. Based on the assumed accident involvement rate for years 1995 and 2000, OWMC generated traffic is estimated to add less than 0.2 and 0.3 accident involvements, respectively. Subsequently, the residual risk of OWMC generated traffic accident involvements is very small.

5. SUMMARY OF POTENTIAL MITIGATION NEEDS

Prior sections of this chapter have addressed the significance of change resulting from OWMC site operations during the 1995 (2000) operating year and identified the potential areas for mitigation of associated transportation risks and impacts. Table 5.3, items 1 through 7 provides a summary of mitigative need and potential mitigative actions for risk and impact management and also identifies the agencies that would likely be involved in the application of these measures. The mitigative measures proposed in this table were drawn from the long list of measures tabulated in Section 7.4 of Chapter 2. Some of the potential measures identified in the long list could not be appropriately addressed by the transportation consultant, as they are either indirect to the scope of our work or are considered more suitable to the work scope of other OWMC consultants. For example, the following two potential measures could more appropriately be addressed by OWMC operations and/or their engineering consultant:

- suitability of operating hours of this facility; and

- need for contingency parking facilities to accommodate transport shipments arriving outside of normal receiving hours.

During the course of the OWMC public involvement program, various agencies, public groups and individuals have expressed concerns or identified specific issues which relate to the OWMC transport requirements. The transportation consultant has addressed these concerns/issues in this chapter. Specific access route concerns are risk-related and most of these have been addressed in the more detailed review of historic accident experience on the access route system presented in Appendix B. The results of these analyses have therefore been summarized in Table 5.3 under part B items 1 through 6.

CONCERN/SECTION REFERENCE	CONSIDERATION	PREDICTED CHANGE	SIGNIFICANCE
A. CONCERNS BASED ON TRANSPORTATION FACTOR ANALYSES			
1. Increased Risk of Fatal or Personal Injury Accident Involvements Due to OWMC Generated Transport (Section 2.3)	Year 1995 (2000) operation of the OWMC waste treatment facility will generate 168 (328) two-way truck and 364 (482) employee movements daily which will increase the potential for human health risk due to fatal and injury accidents	OWMC Transport operations are expected to produce: - one fatal accident involvement every 34.8 (17.8) years - one injury involvement every 1.4 years (1.4 per year)	Without OWMC t ration in year the number of fatal and inju involvements i to be 52 (62). increase in fr resulting from operations is 0.7 (1.3). As annual increas frequency with the fountain y 1.6, the chang is reasoned to significance.
2. Spillage of Hazardous Materials which may pose Human Health or Environmental Risks (Section 2.4)	Year 1995 (2000) operations of the OWMC waste treatment facility will generate 45 (88) loaded truck movements each workday to carry special wastes, and additives and reagents	OWMC truck transport movements are expected to produce an in-transit spill of wastes or additives and reagents once every 3.4 (1.7) years. Only a portion of spills would pose a human health or environmental risk	Based on the r risk assessmen (Environ Corp. the risk of a dent related s per 4.6 years. noted from our the waste mate expected to be only 8% would potential risk health if a si spill occurred frequency of s approximately years or more. frequency exce expected opera the facility, are of low sig
3. Site Entrance Impacts of the West Lincoln Site (Section 3.1)	Site design and operations have defined a need for four site entrances from Schram Road and an emergency service access from Highway 20	On any one working day three of the four Schram Road entrances would be used for: - 90 (176) two-way truck movements at operating plant - 78 (152) two-way truck movements at landfill entrance 364 (482) two-way employee movements to administration area	Impact is not since sufficie exists to cons required entra existing road Highway 20 can an emergency a
4. Impacts on Schram Road Due to OWMC Operations (Section 3.1)	Schram Road is an existing gravel surfaced local township road with a 1986 average daily traffic of 120 vehicles. The OWMC proposal to add four site entrances will impact this access road link	Background traffic on Schram Road is estimated at 160 (160) vehicles per day in 1995 (2000). OWMC operations in 1995 (2000) will add some 532 (810) workday trips of which 168 (328) will be medium and heavy trucks	The additional traffic includi expected with O operations will significant imp Schram Road

	POTENTIAL FOR MITIGATION	ACTIONS	AGENCIES INVOLVED
affic gene- 1995 (2000) ccess route y accident estimated The quency OWMC stimated at the average in ut OWMC over ar period is due to OWMC have a low	As risks are relatively low the opportunities are minor and complex, involving drivers, vehicles and the road system	Assist in driver training, assist in emergency response training, on-site vehicle inspection, monitor exposure statistics	OWMC MTC RMN. OPP Waste Haulers Town of Lincoln Town of Pelham Township of West Lincoln
sults of the consult analyses, ajor acci- ills is 1 They also analysis of ials treated that ose a to human nificant The ch spills is per 50 As such ds the ing life of hese events ificance	As spill frequency is relatively low, the opportunities to mitigate vehicle accident related spills (one every 9.1 (4.6) years) is low. A higher potential exists to mitigate equipment failure spills estimated at one every 5.5 (2.7) years	Assist in driver training, assist in emergency response training, on-site vehicle inspection, monitor exposure statistics and spill frequencies	OWMC MTC MOE OPP Niagara Police Force Waste Haulers Town of Lincoln Town of Pelham Town of West Lincoln
ignificant frontage ruct the ces; and the eometrics on accommodate ess	Construct the required entrances to mitigate these access needs. Development of emergency access on Highway 20	Construct four site entrances from Schram Road based on MTC arterial road standards and criteria. Emergency entrance from Highway 20 to be constructed to meet King's Highway entrance design	OWMC Township of West Lincoln (Schram Road) MTC (Highway 20)
otal g trucking MC facility produce a ct on	Mitigation is possible and will include major upgrading to produce a higher type all-weather road and pavement structure	Reconstruct Schram Road to provide a two-lane high type pavement with adequate shoulders, drainage, etc.	OWMC Township of West Lincoln

TABLE 5.3

OWMC PHASE 4B - TRANSPORTATION SUMMARY OF MITIGATION POTENTIAL FOR TRANSPORTATION RISKS AND IMPACTS ON THE LOCAL AND REGIONAL ACCESS ROUTE

CONCERN/SECTION REFERENCE	CONSIDERATION	PREDICTED CHANGE	SIGNIFICANCE	POTENTIAL FOR MITIGATION	ACTIONS	AGENCIES INVOLVED
5. Impacts at Highway 20/Schram Road/Silverdale Road Intersection (Section 3.2)	With Schram Road providing access to the OWMC site operations, an increase in turning movements would occur at the Highway 20 intersection. The improvement requirements are complicated by the existing 50 m jog between Schram and Silverdale Roads	Site construction traffic would add some 500 peak hour turning movements to and from Highway 20, while on-going site operations would generate 91 (148) peak hour movements two-way	The existing intersection of Schram Road/Highway 20 cannot safely and efficiently accommodate the expected volume of traffic associated with the OWMC facility, therefore improvements are warranted	Mitigation is possible and has been based on MTC King's Highway design criteria. This requires that the 50 m jog be eliminated and that turning lanes be constructed at the intersection to provide for safe operations	The proposed design would eliminate the existing jog and provide a left turn storage lane on Highway 20 and a right turn channelized lane to Highway 20. Property acquisition may also be required	OWMC MTC (Highway 20) Township of West Lincoln (Schram and Silverdale)
6.a) Construction Period Traffic Impacts on Access Route Due to OWMC Generated Traffic Movements (Section 3.3)	OWMC site development (construction-1990) will generate additional travel movements on the defined local and regional access route	Peak month construction traffic daily surcharge ranges from 200 to 1 512 movements between the QEW and Schram Road (2% to 43.2% increase over baseline)	The traffic expected during the construction period will vary from time to time, the peak period will last about one month. Approximately two-thirds of the daily traffic is related to the work force and will occur in the A.M. and P.M. peaks. Due to the short term of these impacts they are not considered a significant impact on the roadways operation	No additional mitigative measures beyond those described in items 4 and 5 above	No specific actions warranted on the road sections from QEW to Highway 20/Schram Road intersection other than monitoring to maintain optimum operations	MTC RMN OPP OWMC
6.b) Operation Traffic Impacts on Access Route Due to OWMC Generated Traffic Movements (Section 3.3)	OWMC operations in 1995 (2000) at the 150 000 t/a (300 000 t/a) operating level will generate additional travel movements on the defined local and regional access road	The 1995 (2000) operations will add 64 (124) to 368 (594) daily movements or a 0.5% (0.8%) to 10.2% (16.8%) increase over the baseline. On Schram Road 532 (810) work day movements are added in 1995 (2000)	On Regional Road 24 the percent change in the traffic volume is less than the annual average growth rate. On Highway 20 the percent growth is more significant, however the spare capacity on this road way can accommodate the addition traffic volumes. Thus, the change in volume levels is of low significance	No additional mitigative measures beyond those described in items 4 and 5 above	No specific actions warranted on the road sections from QEW to Highway 20/Schram Road intersection other than monitoring to maintain optimum operations	MTC RMN OPP OWMC
7. Potential for an Increase in Accident Involvements on the Access Route Due to OWMC Traffic Operations (Section 2.2)	OWMC operations during year 1995 (2000) at 150 000 t/a (300 000 t/a) operating capacity will generate trucking and employee travel on the access route which will increase the number of potential accident involvements on the route	It was predicted that OWMC generated traffic will result in 2.4 (4.4) additional accident involvements in year 1995 (2000) on the 22.2 km route. This represents an increase of 1.6% (2.6%) over the year 1995 (2000) expected accident involvements	Estimated year 1995 (2000) accident involvement frequency without OWMC operations is 145 (173). With OWMC operation the 1995 (2000) increase is 2.4 (4.4). The growth in background travel accident involvements averages 5.5 per year, while OWMC travel would add less than one half year increase in 1995 and less than a one year increase in 2000. Thus significance is low	For the total access system the increase in the involvements is too small to warrant mitigation	No specific actions could be identified along the access route other than the improvements associated with concerns 4 and 5 above	MTC RMN OPP OWMC

OWMC PHASE 4B – TRANSPORTATION SUMMARY OF MITIGATION POTENTIAL FOR TRANSPORTATION RISKS AND IMPACTS ON THE LOCAL AND REGIONAL ACCESS ROUTE

continued ...

CONCERN/SECTION REFERENCE	CONSIDERATION	PREDICTED CHANGE	SIGNIFICANCE	POTENTIAL FOR MITIGATION	ACTIONS	AGENCIES INVOLVED
B. SPECIAL CONCERNS IDENTIFIED THROUGH PUBLIC INVOLVEMENT AND MICRO ANALYSIS OF ACCIDENT DATA						
1. Too Much Truck Traffic on NRR#24 Now	In 1986 between 5000 and 8500 average daily vehicle movements occurred between the QEW and Highway 20. Of these, between 1100 and 1600 movements are comprised of medium and heavy trucks	By 1995 (2000) a 30% (49%) to 55% (100%) growth in background traffic is expected including trucks. As OWMC truck transport ranges from 64 (124) to 142 (276) vehicles/workday, it would add 2.5% (3.7%) to 10% (16.8%) to 1995 (2000) truck traffic	Regional Road 24 is simply performing the function for which it was built. The impact of OWMC operations is equivalent to 2 (3) months growth in background traffic to 9 (15) month for the years 1995 (2000). This change is reasoned to be of low significance	No mitigation is warranted	None	
2. Concern Over Potential for School Bus Accidents with Waste Hauling Vehicles (Appendix B)	There is existing public concern over the maintenance of school bus safety on the access route. Therefore the increase in trucking generated by OWMC operation and the types of materials hauled increases the concern	OWMC generated trucking would add a small amount of trucking (see item 6 above), and a small number of accident involvements (see item 7 above). In-transit spillage of materials is also infrequent (see item 2 above)	School bus operation on the access route has not involved a reportable accident over the three-year period analyzed. Potential for growth in background traffic is more significant than OWMC general traffic surcharge	No mitigation is warranted	None, but monitor	MTC RMN OWMC
3. Accident Experience on Access Route	The public is concerned that the access route has a higher than normal accident rate	The OWMC facility will not alter the existing accident rates on the roadway	The ovarall 1983-85 accident event rate for the access route is less than the provincial average for Secondary Highways. The accident rate on Highway 20 is less than the provincial average for King's Highways.	No mitigation is warranted	None, but monitor	RMN MTC
4. Concern Over Potential for Agricultural Vehicle Accidents with Waste Hauling Vehicles (Appendix B)	The lands adjoining the access route are largely rural in character and agricultural equipment is moved on the route between fields. The low speed movement of oversized equipment is a concern due to conflicts with other traffic	See item A7	OWMC generated traffic increase is a minor factor in consideration of the overall increase in background traffic. Two accidents have occurred over a three-year period. As no data are available on equipment exposure, it is not possible to identify these as high or low frequency occurances	Farm implement movements (timing and location) controlled by operators who should attempt to avoid periods of bad visibility and heavier traffic. Improvements (widening) of roadway shoulders could avoid present conflicts	Local road authorities to monitor and institute corrective actions as may be deemed appropriate, e.g. widening of shoulders	MTC RMN Township of West Lincoln

TABLE 5.3

OWMC PHASE 4B – TRANSPORTATION SUMMARY OF MITIGATION POTENTIAL FOR TRANSPORTATION RISKS AND IMPACTS ON THE LOCAL AND REGIONAL ACCESS ROUTE

continued ...

CONCERN/SECTION REFERENCE	CONSIDERATION	PREDICTED CHANGE	SIGNIFICANCE	POTENTIAL FOR MITIGATION	ACTIONS	AGENCIES INVOLVED
5. Weather and Visibility Conditions Along the Access Route (Appendix B)	There is a perception that NRR#24 experiences abnormal weather and visibility conditions which increases the potential for accident occurrence	See item A7	Accident experience on the route appears to be typical of rural Niagara Region experience. However, six locations were identified that may be considered accident prone under poor visibility (weather) conditions	Inadequate database exists to confirm the adverse experience and to select appropriate mitigative actions, e.g. road lighting, signage	Monitoring of six locations proposed to confirm mitigation needs and to identify appropriate actions	RMN MTC
6. Frequency and Severity of Truck Transport Accidents on Access Route (Appendix B)	A perception exists that trucks are more frequently involved in severe accidents	See item A7	Phase 4A analyses confirmed that heavier trucks have a higher involvement frequency. Due to an inadequate database it was not possible to verify this on the access route	Three years of truck accident analysis identified three locations on access route that produce a higher than average incidence of truck related accidents (see App. B)	Monitoring of the three locations is proposed to confirm and establish appropriate mitigative actions	RMN MTC OWMC
7. Proposed Use of Rail as a Substitute Mode for Hauling Special Wastes	The rail mode is perceived to be safer than road transport for hauling of OWMC wastes to be treated	Rail is considered as an opportunity for bulk shipment of additives/reagents. However, there is insufficient data available to carry out a comprehensive comparison of the risks for the two modes	Dispersion of source areas and relatively small quantities of individual shipments of special wastes fails to support the use of a rail shipment mode	Future change in waste handling methods including wastes consolidation centres, may enhance the opportunity for rail transport of wastes. However, relative safety of this mode should then be addressed	Monitor change in future waste handling methods and protect identified rail corridor into site for possible future construction and use	OWMC MOE
8. Proper Training and Equipping of Emergency Response Groups	Emergency response groups have indicated a need for more extensive training and special equipment to cope with special waste spills	Frequency of in-transit spills of special wastes, additives/reagents is one every 3.4 (1.7) years. Potential for a major spill due to an accident is one in every 9.1 (4.6) years	The provision of adequate emergency response in the event of a spill is essential to minimize risks to the environment. However, the potential of spills that would produce human health or environmental risk is small (see Item 2)	OWMC has indicated a desire to assist emergency response groups in training and equipment. They will also provide expertise and advise in the proper handling of high risk material spills	Assist in training, provision of necessary equipment, test emergency response plans as may be requested	OWMC RMN Town of Lincoln Town Pelham Towhship of West Lincoln
9. Feasibility of an Exclusive Access Route from the QEW to the OWMC Site	Based on the perception of a heavy transport demand to the site and high risks associated with transport, an exclusive OWMC route has been proposed	OWMC operations in 1995 (2000) are predicted to require 90 (176) two- way truck transport movements on workdays for special wastes and additives/reagents. Predicted spill frequency is one every 3.4 (1.7) years	Justification does not exist to consider the development of a new access route from the QEW which would have substantial impact on other lands. Both spill frequency and accident risk is low	No mitigation is warranted	None	

OWMC PHASE 4B - TRANSPORTATION
SUMMARY OF MITIGATION POTENTIAL
FOR TRANSPORTATION RISKS AND IMPACTS
ON THE LOCAL AND REGIONAL ACCESS ROUTE

continued ...

CHAPTER 6

MONITORING

1. INTRODUCTION

1.1 Purpose

The purpose of this chapter is to identify the transportation-related environmental monitoring program for the operation of the OWMC Waste Treatment Facility to be located on the Preferred Site in the Township of West Lincoln, the Regional Municipality of Niagara. This program would become a part of the OWMC Impact Management System (IMS) which is being developed to monitor the site and surrounding area to discern signs of adverse effects and to mitigate or resolve the problems identified.

The transportation monitoring program will serve to ensure that the predicted risks and impacts associated with the transport component of OWMC site operations are minimized with respect to the defined goals of OWMC.

1.2 Scope and Objectives

Transportation environmental monitoring involves the surveillance of traffic operations within the immediate site/site vicinity and along the preferred local and regional access route from the QEW to site entrances. As a preferred routing for the majority of truck transport movements delivering special wastes and process additives and reagents to the site has been identified, monitoring of alternative available routings is also a consideration. The objective here is to detect inappropriate routings so that corrective action can be instituted.

The monitoring of off-site activities for risk and impact management, involves overlapping areas of responsibility. Other identifiable agencies having either direct or indirect responsibilities for public safety and impact management include:

- Ministry of Transportation and Communications (MTC);
- Ministry of the Solicitor General; Ontario Provincial Police
- Regional Municipality of Niagara (RMN);
- Town of Lincoln;
- Town of Pelham, and
- Township of West Lincoln.

The preferred access road system falls within three jurisdictions: MTC, RMN and the Township of West Lincoln. Provision of emergency response for fire, ambulance, police, etc., may involve all agencies identified, and others. Consequently, the OWMC transportation monitoring program gives recognition to these overlapping areas and levels of responsiblility and the need to develop a cooperative approach.

The transportation noise impact effects are excluded in that these are to be dealt within the Report, S.S. Wilson and Associates, 1987, Site Assessment Phase 4B - Noise.

1.3 Approach and Overview

A long list of possible monitoring measures and follow-up activities was developed and is presented in Table 6.1. This listing forms the bases for the organization of the more detailed discussion of transportation monitoring needs and actions presented in the following section. In that not all possible monitoring actions fall within the scope of the transportation discipline, these have been identified for possible acition by other consultants or OWMC staff.

TABLE 6.1
OWMC PHASE 4B - TRANSPORTATION
POSSIBLE TRANSPORTATION MONITORING REQUIREMENTS AND CONTINGENCY MEASURES

GOAL/FACTOR	INDICATORS	POSSIBLE MONITORING AND CONTINGENCY MEASURES
1. Human Health and Environmental Risks and Impacts on Residents and Community Features	- Adherence to use of the preferred local and regional access route by OWMC generated truck transport hauling special wastes and additives and reagents	- Generator contractural agreements to identify the routing requirements for transport and shipment times; - Employ random surveys to identify routes used in site vicinity and cross check with waybill information obtained from transport operator at point of entry to facility; - Follow-up with generator/transport company required to correct all violations detected by OWMC; - Attempt to secure appropriate provincial legislation for formal designation of the access route so that police enforcement of routing can be undertaken.
2. Human Health and Environmental Risks	- Frequency of motor vehicle accident involvements by OWMC generated truck movements	- Arrange for police and/or Provincial and Regional safety officials to provide periodic reports to OWMC on accident events and spill events occurring on the local and regional access routes;

TABLE 6.1
OWMC PHASE 4B - TRANSPORTATION
POSSIBLE TRANSPORTATION MONITORING REQUIREMENTS AND CONTINGENCY MEASURES
(continued)

GOAL/FACTOR	INDICATORS	POSSIBLE MONITORING AND CONTINGENCY MEASURES
2. Human Health and Environmental Risks (cont'd)	- Frequency of accident related spills and non-motor vehicle accident spills	- OWMC to compile data on generator/transport company shipment frequency and collate with adverse event frequency to detect accident/spill prone shippers; - OWMC to warn shippers demonstrating high frequency of accident/spill events based on exposure; - In the event that appropriate corrective action does not occur, OWMC to consider other actions to eliminate shippers, carriers or drivers from OWMC services.
3. Human Health and Environmental Risks	- Frequency of motor vehicle accident involvements by OWMC generated truck movements	- OWMC to assist in the training of transport drivers to promote safe operation and counter measures; - OWMC to provide information to generators/transport companies on proper emergency procedures and resources available to counter adverse events.
4. Human Health and Environmental Risks	- Adherence to emergency response plans following the occurrence of spills enroute	- OWMC to assist emergency response groups in plan development and training and provide suitable support services; - OWMC to monitor results of the emergency response team and participate in plan testing.

TABLE 6.1
OWMC PHASE 4B - TRANSPORTATION
POSSIBLE TRANSPORTATION MONITORING REQUIREMENTS AND CONTINGENCY MEASURES
(continued)

GOAL/FACTOR	INDICATORS	POSSIBLE MONITORING AND CONTINGENCY MEASURES
5. Human Health and Environmental Risks	- Change in accident frequency rates on the local and regional access route	- OWMC to assist the various responsible road authorities in the review of changing operating conditions on these roads; - OWMC to cooperate with these agencies in developing timely solutions to overcome short or long term operational problems.
6. Environmental Impacts	- Time pattern of arrivals of transport vehicles at the OWMC site	- OWMC to review arrival and departure times of transport vehicles at the plant; - Consider need for a safe and secure holding area for transport vehicles arriving outside the normal operations hours due to unforseen events.
7. Human Health	- public response/ actions to spill events enroute	- OWMC to provide for public awareness and education program to minimize unnecessary public exposure following a spill event; - Assist emergency response teams with follow-up programs as may be required.

The detailed discussion also recognizes the overlap in responsibilities and jurisdiction between municipalities and agencies. Thus, an integrated and cooperative approach is proposed to deal with risk and impact monitoring and management by OWMC.

2. MONITORING PROGRAM

2.1 Access Route

2.1.1 Adherence to preferred route

The selection of the preferred route from the QEW to the Preferred Site was based on the evaluation of many routing options with the objective of minimizing risks and impacts. It is therefore desirable to maximize assurance that the selected route is used and other alternates avoided.

Existing Ontario legislation contains no provision for the designation or enforcement of use of the preferred route. Thus, the only mechanism available to OWMC to control the use of the preferred route, is to include transport routing requirements in contractural agreements with waste generators.

Recognizing the weaknesses in this control mechanism, random monitoring of access route usage should be established. A relatively simple data collection and analysis procedure is available for OWMC monitoring. The procedures and data collection requirements are illustrated in the following points by which inappropriate routing can be detected:

- Three data collection stations are necessary to detect any misroutings:

  - on Highway 20 immediately west of Schram Road
  - on Highway 20 east of the NRR 24 intersection, and
  - on NRR 24 south of Highway 20

- At each station data would be recorded to identify every waste or additive and reagent hauling vehicle, including the time of day when the movement occurred;

- Similar data recording is assumed to occur at the OWMC plant entrance, supplemented by waybill information which will provide the required data on origin of each shipment;

- The two data sets are then matched using available microcomputer programs and in recognition of the travel time lag between vehicle detection at the road stations and at the plant gate;

- All matched vehicle trips are then quickly reviewed to confirm that the routing used is appropriate with respect to the trip origin.

- Where misrouting is detected, a warning to be issued to both the shipper and carrier as to the violation of the contractual agreement.

There is a potential for a more positive and effective monitoring program but this would require new provincial legislation that would designate the preferred access route as a waste haulage route. With this designation it would then be possible for both the Ontario Provincial Police and the Niagara Region Police Force to carry out surveillance and enforcement on non-designated routes within the general site area. It is suggested that this opportunity be explored by OMWC in consultation with all agencies involved.

2.1.2 Frequency of OWMC generated vehicle accident involvement and spills

Forecasts have been produced as to the frequency at which OWMC generated truck movements may be involved in accidents, fatal accidents, injury accidents and material spills resulting from these accident involvements. These predictions are based on a number of parameters including:

- annual number of OWMC truck shipments;
- historic data on all-vehicle accident rates and all-vehicle involvement rates on each access road link; and
- medium and heavy truck accident involvement rate.

The OWMC databank can be used to compile monthly and annual summaries of shipment frequencies by carriers. With the cooperation of the OPP and Niagara Region Police Force, as well as safety officials employed by MTC and the RMN, it would be possible to monitor the overall frequency of accident events and spill events associated with OWMC generated trucking. By combining both databases, the relative safety of haulage can be discerned on an exposure basis, based on accident involvements or spill frequency per one million OWMC generated truck kilometers of travel. For large volume haulers it would also be possible to 'track' individual performance which could be used as an early warning system if their frequency of involvements significantly exceeds anticipated norms.

Again, with the cooperation of MTC and RMN safety officials, it is possible to 'track' the safety measures and statistics on the local and regional access route. This could be done for the entire system as well as by individual road links. Although it has assumed that accident rates and accident involvement rates are quite stable on these road sections, any significant departure from current norms should be monitored. The objective here is to discern trouble spots which may require corrective actions. Such actions could include:

- modifications to existing roadway geometric design;
- modifications to or upgrading of traffic control devices;
- need for speed zoning due to change in land use and development conditions along various road sections; and
- need for any change in current maintenance practices and procedures along the access road system.

2.1.3 Other monitoring requirements

There are a number of additional monitoring requirements wherein the specifics of monitoring cannot be readily defined at this time. Most if not all of these relate to contingency planning and emergency response procedures that at this time have not been developed sufficently to provide a basis for assessing the monitoring needs and requirements. Consequently, a list has been prepared which tabulates the actions or mitigative measures that are identified as OWMC corporate commitments.

Table 6.2 presents a listing of these measures which will require monitoring.

TABLE 6.2

OWMC PHASE 4B - TRANSPORTATION

OTHER MONITORING REQUIREMENTS BASED ON OWMC CORPORATE COMMITMENTS

MONITORING

- Provide technical advice on the nature of spilled material and recovery/clean up procedures.
- In consultation with local municipalities and their emergency response groups, prepare comprehensive and integrated community emergency planning including an adequate warning system, a trained emergency response team and regular testing of the plan.
- Establish a complaints bureau to deal expeditiously with public concerns of risks or impacts associated with overall site operations.
- Scheduling for waste truck transport along designated routes through contractual agreements with generators and haulers.
- OWMC to enter into agreements and provide funding for the establishment of a local monitoring committee to provide an opportunity for the community to review monitoring data.

CONTINGENCIES

- Assist special waste haulers and/or training institutions in driver training/certification.
- Develop and/or assist in the development of public awareness and education programs concerning emergency procedures applicable to in-transit spills of special wastes.
- Assist local municipal and regional authorities in selecting and acquiring necessary response equipment.

In addition OWMC has initiated discussions with municipal officials and fire chiefs in the site environs. These discussions will address the following issues:

- number of trucks carrying special wastes, or additives/ reagents expected on local and regional roads;
- type and properties of materials to be transported;
- type of trucks to be used;
- required response in the event of a spill or leakage;
- identification of additional training of response personnel, equipment and manpower;
- preparation of Emergency Response Plans;
- integration of OWMC's ERP (intent and capabilities) with the municipalities.

2.2 Other Monitoring Actions

One possible monitoring action, identified in Table 6.1, that has not been fully addressed, concerns the potential arrival of special waste vehicles or certain of the additives and reagent vehicles at or near the OWMC facility during hours when the plant gate is closed. Normally this would be the case between 5:00 p.m. and 7:00 a.m. on normal workdays, and on weekends and holidays. As there is a public perception that this could happen with some frequency and that vehicles would be forced to park for protracted periods on the shoulder of the access route, posing a potential increase in accident risk or frequency of spillage, either a mitigitive action or monitoring is proposed. Mitigation could involve the construction of a late arrival parking facility on the OWMC site and outside the facility operating area. At a minimum, a monitoring program should be established to develop information on the need to mitigate this potential concern.

This matter will be addressed by the engineering consultant in their report, Monenco Limited, 1987, Site Assessment Phase 4B: Facility Characteristics.

CHAPTER 7

FACILITY DECOMMISSIONING

1. INTRODUCTION

1.1 Purpose

The purpose of decommissioning the OWMC Facility is to leave the site in an environentally safe condition that is consistent with the final use of the site. As on-site and off-site transportation is required to achieve the objective, this chapter identifies in a general way the transportation related requirements to site decommissioning and closure.

1.2 Scope

This chapter presents a preliminary impact assessment of the transportation needs associated with the decommissioning of the facility. As decommissioning would occur at the end of the life cycle of the facility, a detailed closure plan must be developed and approvals secured in advance of plan implementation. Since this activity would occur many years in the future and be based upon conditions at that time, the details of the future transportation impacts associated with decommissioning cannot be specifically detailed at this time.

1.3 Approach and Overview

Figure 7.1 identifies the activities involved in the OWMC facility decommissioning process. This of course will be refined and expanded in detail to reflect the specific needs and requirements as the time approaches for implementation of the facility closure process. Also a detailed work plan and schedule would be developed so that the transportation impacts associated with closure can be assessed.

Due to the current lack of quantitative information and a time schedule, the daily transport needs and resulting impacts cannot be determined for site closure. However, it has been possible to identify the types of transport movement that will likely be required during the decommissioning process.

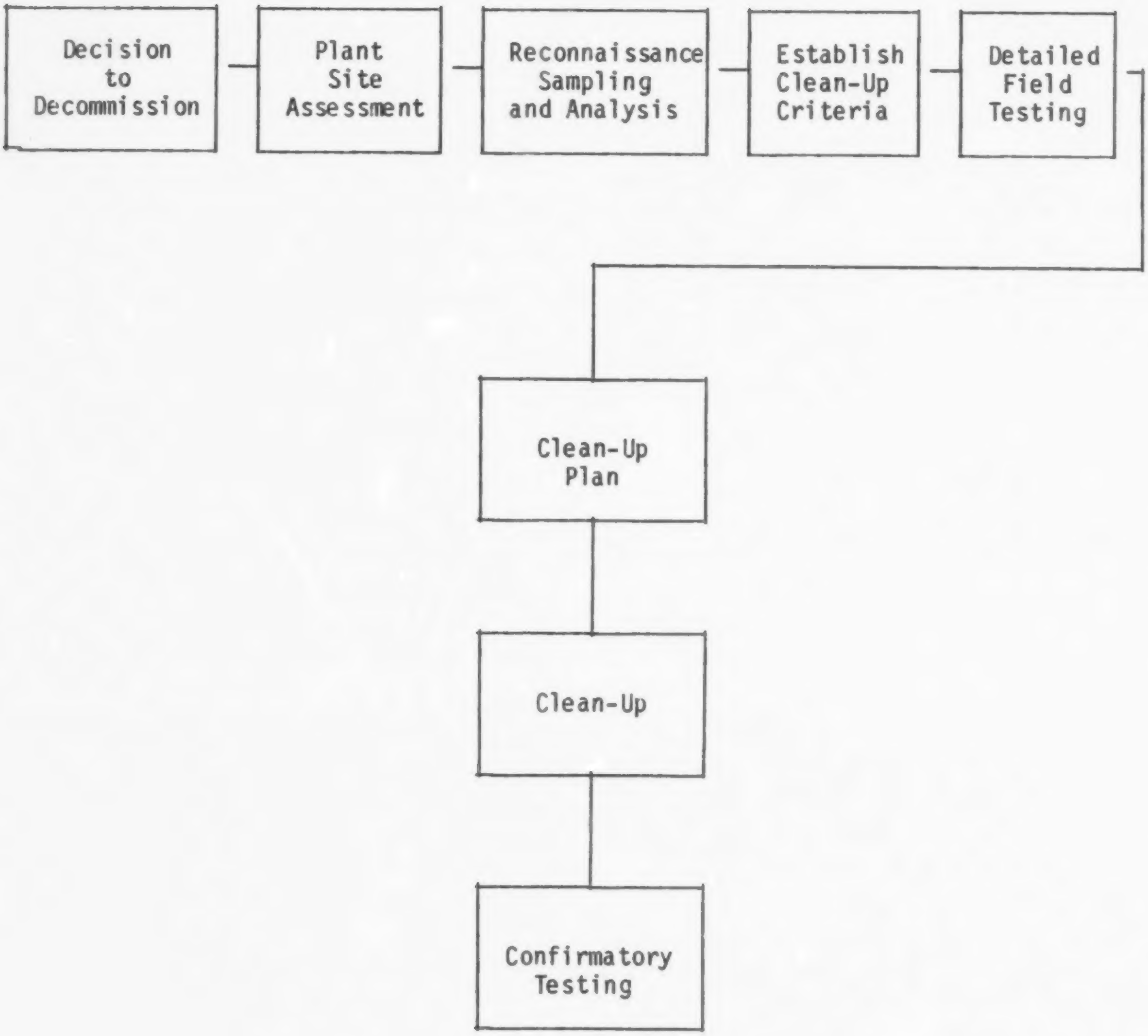
2. TRANSPORT REQUIREMENTS

2.1 Access Routes

It is assumed that the roadways to be used for transport will include many if not all routes that were used during initial site construction and during the operating life of the OWMC facility. Should it be necessary to remove contaminants (residual waste materials) from the site during closedown, the most appropriate routing for the conveyance of these materials would be on the preferred access route between the site and the QEW. This assumes that these wastes would be transported to an existing waste treatment centre for proper treatment and disposal.

FIGURE 7.1

STEP-WISE APPROACH TO DECOMMISSIONING


Decision to Decommission
Plant Site Assessment
Reconnaissance Sampling and Analysis
Establish Clean-Up Criteria
Detailed Field Testing
Clean-Up Plan
Clean-Up
Confirmatory Testing

2.2 Possible Transport Needs

The following possible transport needs have been discerned during the implementation of the decommissioning and closure plan:

a) Labour force

A small labour force would be required to implement the closure plan. This may include a segment of the plant operating staff knowledgeable with the facility operation and contractor forces experienced in industrial plant dismantling and salvage. To a degree the forces required could be quite similar to those employed during plant construction, although the size of the labour force would likely be smaller.

b) Process equipment and storage

The shutting down of process equipment and storage facilities would require the removal of any residual wastes or by-products of treatment. As these may be harmful to human health or the environment, the residuals must be removed, equipment decontaminated and the waste transported off site to an existing treatment centre for disposal.

This activity is assumed to be far less intensive than that encountered during the operating life of the facility.

c) Facility dismantling

This activity is a reversal of the facility construction, and would therefore use a workforce and equipment similar to that required during initial site construction. Salvagable items and scrap would then be transported off site for appropriate disposal.

d) Site redevelopment

At a minimum, site redevelopment would involve restorative grading of the facilities operating area to maintain surface drainage and may involve partial or total removal of the external buffer berm. In the event that the berm is removed, it would provide considerable material for final site grading and could provide a source for required topsoil to finish the regrading.

With the described procedure, the need for off-site transport of final grading materials may be eliminated or at least minimized. This would reduce the transportation impacts associated with the hauling of grading materials.

After final grading, grass seeding and landscaping would likely be necessary. Transportation associated with this task would be minor.

e) Leachate Disposal

Monitoring leachate quality and quantity will continue during the closure and post closure periods. While storage facilities can be provided for leachate requiring treatment, it is likely that leachate will require transport off site to a treatment facility for disposal. The number of annual transport movements required to facilitate this action cannot be quantified at this time; however, estimates of the number of transport movements should become available based on site operating experience.

2.3 Summary and Conclusion

There will be a future need to develop a comprehensive decommissioning plan during the final years of site operation. Such a plan will give recognition to the history of plant operation as well as the end land use that is deemed to be desirable.

From the current perspective, it is believed that the transportation requirements associated with decommissioning and closedown of the site will be parallel to but less intensive than that associated with original plant construction. Based on this conclusion, the transportation impacts produced would be of lower significance.

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Final report

OWMC

Ontario
Waste Management
Corporation

A provincial crown corporation.

DILLON

SITE ASSESSMENT
PHASE 4B:
TRANSPORTATION
TECHNICAL APPENDICES

Prepared for
The Ontario Waste Management Corporation

Submitted By

M.M. Dillon Limited
Consulting Engineers and Planners

October, 1987

DILLON
Consulting Engineers • Planners
Environmental Scientists

OUR FILE: 9924-31-1
YOUR FILE: S1.1-MMD-T

23 October 1987

Mr. J.G. Micak
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Attention: Mr. P. Hunt
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Site Assessment
OWMC Phase 4B - Transportation
Technical Appendices

Dear Sirs:

We are pleased to submit the enclosed final draft report, Site Assessment Phase 4B: Transportation Technical Appendices.

This document is supplementary to our report, OWMC Site Assessment Phase 4B: Transportation and contains Appendices A through through G.

Yours truly,

M.M. DILLON LIMITED

John R. Crosby

JRC/bl
Encls.

John R. Crosby, P.Eng.
Project Manager - Transportation

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APPENDIX A

VERIFICATION OF PHASE 4A RESULTS

1. INTRODUCTION

The verification process involves an examination of the changes in the roadway statistics which may affect the transportation risks and impacts associated with the preferred site selected during Phase 4A. The areas of examination included the following:

- accident experience
- existing and projected traffic volumes
- proportion of trucks in traffic stream

This comparison was carried out with the use of statistical and value comparison techniques in accordance to the methodology outlined in Chapter 2.

The comparative analysis was undertaken to verify Phase 4A risk analysis which was based on transport of 300 000 t/a of special waste plus the required process additives and reagents. Therefore, the updated OWMC generated vehicle involvement rate in accidents and spill frequencies assume the same quantities of waste transport. New values for Phase 4B risk and impact assessment based on the OWMC proposal for a 150 000 t/a and 300 000 t/a ultimate facility capacities are presented in Chapter 4.

The examination concludes that the changes which have taken place in the transportation components, will not significantly alter the findings of the Phase 4A analysis.

2. ACCIDENT EXPERIENCE

2.1 Overview

The historical accident experience on the local and regional access route is an important component in the calculation of transportation risks affecting both estimated spills and accident involvements. During Phase 4A the accident experience was compiled from the accident records for the years 1980 to 1982; however this database and method of analysis has been updated in Phase 4B to 1983 to 1985 accident experience. The modifications indicate a slight reduction in the accident involvement rate which produces a reduction in spills . These small changes in values have no statistical significance.

The comparisons involve the following components of accident experience:

- number of spills per year
- number of two-way accident involvements per year
- relationship between accident involvement and accident event rates

2.2 Results of Analysis

Prior to the comparison of Phase 4A results with the updated information, the initial comparisons dealt with the differences in the 1983, 1984, and 1985 data. The purpose of these comparisons was to determine what affect, if any, that the change in criterion for reporting a property damage accident (from $400 to $700) had on accident rates or proportion of property damage accidents.

The second stage was a comparison of the Phase 4A and updated accident trends and the affect on transportation risks. This involved a series of comparative statistical and value tests as discussed in Chapter 2 Section 4.

This section presents the results of the tests applied to each stage of the analysis.

2.1.1 Comparison of data for years 1983 to 1985 data

Table A.1 shows 1983, 1984, and 1985 accident involvement rates , and the proportion of accident events that involved property damage only, for the total access road from the QEW to the site.

TABLE A.1
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF 1983, 1984, and 1985 ACCIDENT INVOLVEMENT RATES AND ACCIDENT EVENTS INVOLVING PROPERTY DAMAGE ONLY

YEAR	All-Vehicle Accident Invol. Per Mill-veh-km	Proportion of Accidents With Property Damage Only
1983	2.86	70%
1984	2.02	82%
1983 - 1984	2.42	75%
1985	2.00	73%
1983 to 1985	2.26	75%

These data indicate a trend towards lower accident involvement rates in 1985. The accident involvements per million vehicle-kilometers in 1985 are 17% lower than for 1983-84. Over the entire route the change in rate translates to 9.04 fewer accident involvements per million vehicles in 1985 than in the two previous years. On a link by link basis the average change was 0.91 less accident involvements per million vehicles; however, statistical testing indicates that the two database do not differ significantly at the 5% level. In addition the proportion of property damage accidents for 1985 was only 2% less than the 1983/84 data. Therefore, it was demonstrated that the change in the accident reporting process in 1985 has not had significant impact on accident trends on the access route.

2.2.2 Comparison of phase 4A accident data to 1983 through 1985 data

The differences in the accident data were examined in order to determine the impacts they may have on the risks associated with the waste treatment site transport requirements. This analysis involved the following five comparisons:

- number of all-vehicle accident involvements per million vehicles (link by link average difference) - Table A.2;
- ratio of accident involvements per accident event (average of all links) - Table A.3, and Table A.4;
- two way OWMC accident involvements per year (based on total solidification; Phase 4A) - Table A.5;
- annual number of OWMC spills due to collisions (based on total solidification; Phase 4A) - Table A.5;
- annual number of total predicted OWMC generated vehicle in-transit spills (based on total solidification; Phase 4A) - Table A.5.

All these comparison indicated that the accident trends for years 1983 to 1985 applied to the Phase 4A data would produce approximately 20% less accident involvements and vehicle collision related spills, as well as 8.5% fewer spills of all types for the local and regional access route.

a) Comparison of accident involvement rates

The comparison between the Phase 4A and 1983-85 all-vehicle accident involvement rate per million vehicles is shown in Table A.2 on a link by link basis. This tabulation indicates that the accident involvement rate per million vehicles is 21% less for the 1983 to 1985 data than for the Phase 4A data. This translates into a 1.82 average reduction in the number of all-vehicle accident involvements per million vehicles for each link over the Phase 4A analysis. In summary, had the 1983-85 values been used in the Phase 4A analysis for year 2000, a reduction of 12.7 accident involvements per million vehicles would have been calculated for both the background and OWMC related traffic volume.

b) Comparison of accident involvements per event

The accident involvement rates applied in Phase 4A were derived from the all-vehicle accident event rates using a conversion factor of 1.635. This conversion factor was based on an analysis of New Jersey Turnpike data as presented in Appendix J of the Phase 4A Report (Dillon 1985). In order to verify the conversion factor applied in Phase 4A, updated ratios have been calculated for each link of the access route and compared to the factor used in Phase 4A. It is noted that the values in Table A.3 range between 1.41 to 1.82 for the 1983 to 1985 data with an average value of 1.593 which is within 3% of the Phase 4A factor value.

Table A.4 lists the accident involvements per million vehicles, which would result on each link by applying the 1983-1985 ratio of accident involvements per event, to the Phase 4A accident event rates. It is noted that the use of the updated involvement per event data reduces the number of expected accident involvements per million vehicles by 2%.

c) Comparison of annual number of accidents and spills involving OWMC trucks

The change in accident rates will affect the estimated number of accidents and related spills which would be produced by the vehicles generated by the proposed OWMC facilities. The changes

TABLE A.2
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF ACCIDENT INVOLVEMENT RATES FOR PHASE 4A AND PHASE 4B DATA ON LOCAL AND REGIONAL ACCESS ROUTE

LINK DESCRIPTION	LINK LENGTH (km)	ACCIDENT INVOLVEMENT RATES (ALL-VEH ACCIDENT INVOLV/MILL VEH PHASE 4A (80-82)	UPDATED (83-85)	CHANGE FROM PHASE 4A VALUE[1]	%
A. Vineland Townline Road (NRR 24)					
1. QEW to NRR 81	3.8	14.29	8.66	- 5.63	- 39%
2. NRR 81 To Moyer	0.7	1.49	3.80	+ 2.31	+155%
3. Moyer to NRR 73	1.1	2.34	0.79	- 1.55	- 66%
4. NRR 73 to Ninth	3.5	12.00	9.70	- 2.30	- 19%
5. Ninth to NRR 216	3.0	10.29	8.10	- 2.19	- 21%
6. NRR 216 to Hwy 20	4.1	8.73	10.46	+ 1.73	+ 20%
B. Highway 20					
1. NRR 24 to 4A site entrance[2]	5.3	12.14	7.05	- 5.09	- 42%
TOTAL ACCESS ROUTE TO 4A SITE ENTRANCE	21.5	61.28	48.56	-12.72	- 21%

NOTES:

1. Average difference in rates for each link: - 1.82
2. Phase 4A site entrance was assumed to be located off Highway 20 and 200 m west of Schram Road intersection.

TABLE A.3
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF UPDATED VEHICLE INVOLVEMENTS PER ACCIDENT EVENT TO PHASE 4A DATA

LINK DESCRIPTION	VEHICLE INVOLVEMENT PER ACCIDENT EVENT		CHANGE FROM PHASE 4A	
	PHASE 4A[1]	1983 to 1985 Data	VALUE	%
A. Vineland Townline Road (NRR 24)				
1. QEW to NRR 81	1.635	1.82	+0.19	+12%
2. NRR 81 to Moyer	1.635	1.70	+0.07	+ 4%
3. Moyer to NRR 73	1.635	1.50	-0.14	- 9%
4. NRR 73 to Ninth	1.635	1.57[2]	-0.07	- 4%
5. Ninth to NRR 216	1.635	1.61[3]	-0.03	- 2%
6. NRR 216 to Hwy 20	1.635	1.55	-0.09	- 6%
B. Highway 20				
1. NRR 24 to 4A site entrance	1.635	1.41	-0.23	-14%
AVERAGE VALUE:[4]	1.635	1.593	-0.042	- 3%

NOTES:

1. Phase 4A value derived from Appendix J of Phase 4A Report (Dillon 1985)
2. This road section contains three separate sub-sections for accident analysis
3. This road section contains two separate sub-sections for accident analysis
4. Based on ten road sections used in this accident analysis

TABLE A.4
OWMC PHASE 4B - TRANSPORTATION
IMPACT OF 1983-1985 VEHICLE INVOLVEMENT/ACCIDENT EVENT ON PHASE 4A ESTIMATED INVOLVEMENTS

LINK DESCRIPTION	PHASE 4A ACC EVENT PER MILLION VEH	1983-85 VEHICLE INVOL/ACCID EVENT[1]	NEW EST PHASE 4A VEHICLE INVOLVEMENTS PER MILL VEH[2]	CHANGE FROM PHASE 4A[3]	
				VALUE	%
A. Vineland Townline Road (NRR#24)					
1. QEW to NRR 81	8.74	1.82	15.91	+1.62	+11%
2. NRR 81 to Moyer	0.91	1.70	1.55	+0.06	+ 4%
3. Moyer to NRR 73	1.43	1.50	2.15	-0.19	- 8%
4. NRR 73 to Ninth	7.35	1.57	11.54	-0.46	- 4%
5. Ninth to NRR 216	6.30	1.61	10.14	-0.15	- 1%
6. NRR 216 to Hwy 20	5.33	1.55	8.26	-0.47	- 5%
B. Highway 20					
1. NRR 24 to 4A site entrance	7.42	1.41	10.46	-1.68	-14%
TOTAL ACCESS TO PHASE 4A ENTRANCE	-	-	60.01	-1.27[4]	- 2%

NOTES:
1. From Table A.3
2. Derived by combining Phase 4A event rates with 1983 to 1985 vehicle involvement/accident event
3. Compared to Phase 4A involvement/mill veh in Table A.2
4. Compared to total access for Phase 4A in Table A.2

which would take place, based on the total solidification scenario used in Phase 4A, are shown in Table A.5. This table indicates that the potential number of total accident involvements would be reduced by 20%, and total spills by 8.5%.

The statistical significance of the affect of the reduction in accident rates during 1983 to 1985 was examined. Table A.6 summarizes the results of this testing. Based on these findings it is estimated that changes to the accident related data alone does not have a significant impact on the number of accident involvements or spills at the 5% level of significance. This is, in part, due to the relative infrequency of spills and accidents that may occur along the route.

2.3 Conclusions

1. Although the criterion for accident reporting in Ontario increased from $400 to $700 in 1985, there is no statistical difference in the accident involvement rates along the local and regional access road to the Preferred Site; nor has the proportion of property damage accidents decreased significantly for 1985. Therefore it is acceptable to include the 1985 data with the 1983 - 1984 data for purposes of estimating OWMC transport accident involvement frequencies.

2. There is no statistically significant difference between the 1983 to 1985 accident data and the data for 1980 to 1982 at the 5% level of significance.

3. The ratio of accident involvements to accident event rates, originally developed in Phase 4A based upon New Jersey data, is not statistically significantly different (at the 5% level) from the value calculated for the local and regional access route based on 1983 to 1985 data. The current observed ratio (1.591) is within 2% of the earlier ratio (1.635) used in the Phase 4A analyses.

TABLE A.5

OWMC PHASE 4B - TRANSPORTATION

COMPARISON OF POTENTIAL VEHICLE INVOLVEMENTS IN ACCIDENTS AND SPILLS DUE TO OWMC GENERATED TRANSPORT ON LOCAL AND REGIONAL ACCESS ROUTE FOR PHASE 4A AND UPDATED DATA

	BASED ON PHASE 4A DATA[1]	BASED ON UPDATED DATA[2]	CHANGE FROM PHASE 4A	
			VALUE	(%)
Vehicle Involvements				
Annual number of OWMC generated vehicles in accidents:	2.772	2.218	-0.554	-20
Spill Frequency				
Annual number of spills caused by collisions:	0.272	0.217	-0.055	-20
Annual number of in-transit spills by other causes:	0.372	0.372	0	0
Total annual in-transit spills:	0.644	0.589	-0.055	- 8.5

NOTES:

1. Phase 4A values extracted from Phase 4A Transportation Report (Dillon 1985)
2. Derived from the application of accident involvement data in Table A.3 to vehicle volumes on each link as per Phase 4A total solidification as presented in Phase 4A Transportation report

TABLE A.6
OWMC PHASE 4B - TRANSPORTATION
RESULTS OF COMPARISON OF THE IMPACT OF PHASE 4A AND UPDATED ACCIDENT STATISTICS ON THE COMPONENTS OF TRANSPORTATION RISK
YEAR 2000 OPERATIONS AT 300 000 t/a

TEST #	DESCRIPTION	RESULTS
1	Compare 80-82 accident involvement data to 83-85 data	average difference on each link: -1.82 accident involvements/million vehicles - not significant at 5% level
2	Compare the 1.635 conversion factor derived for Phase 4A with that measured on access roads for 1983 to 1985	ratio of vehicle involvements per accident event - Phase 4A (based on N.J. study): 1.635 - 1983 to 1985 average overall links on access route: 1.593 - not statistically different at the 5% significance level
3	Compare two-way vehicle involvements in accidents per year based on total solidification	number of two-way vehicle involvements in accidents/year involving OWMC vehicles (based on TOTAL SOLIDIFICATION) - 1980-1982: 2.77 - 1983-1985: 2.22 - % difference: -20% - not statistically different at 5% level
4	Compare spills per year due to accidents (Total Solidification)	number of spills annually due to accidents involving vehicles generated by site (based on TOTAL SOLIDIFICATION) - 1980-1982: 0.272 - 1983-1985: 0.217 - % difference: -20% - not statistically different at 5% level
5	Compare total spills per year (Total Solidification)	total number of spills annually (based on TOTAL SOLIDIFICATION) - Phase 4A: 0.644 - 1983-85: 0.589 - % difference: - 9% - not statistically different at 5% level

4. The annual number of two-way OWMC generated vehicle involvements in accidents along the local and regional access route based on the 1983 to 1985 data is 20% less than the value calculated during Phase 4A. As a result 20% fewer spills due to accidents involving OWMC generated vehicles along the access route are expected. This result, however; is not a statistically different from the Phase 4A findings at the 5% level of significance.

5. Since the accident rate affects only a portion of the spills estimated for the local and regional routes, the total number of spills is reduced by only 9% over the Phase 4A estimate when the 1983-85 data is applied to the total solidification scenario. This result does not represent a statistically significant change from Phase 4A at the 5% significance level.

2.4 Recommendations

1. The Phase 4B site assessment program should utilize the 1983-1985 accident statistics in the remainder of the analysis for the following reasons:

   - These data represent a more accurate and reliable basis for representing risks due to accidents;

   - Due to the increased level of detail employed in the 1983 to 1985 data analysis it is not practical to combine these data with those of 1980-1982 to produce an average rate. However, it has been demonstrated that no statistically significant difference exists between the independent databases.

3. TRAFFIC VOLUMES

3.1 Overview

The Phase 4A analysis was based on the best available information provided by the appropriate road agencies. At that time the traffic volume information available was for the year 1983, with ten-year growth factors to 1993. During the Phase 4B traffic analysis, 1984 and 1985 traffic volumes have been obtained. This section examines the differences in the existing and projected volumes for Phase 4A and Phase 4B.

3.2 Results of Analysis

Table A.7 presents a comparison of the background annual average daily traffic for the year 2000 based on the base year condition and growth rates applied in Phase 4A and Phase 4B. The results indicate that the latest traffic projections differ from those of Phase 4A by approximately -14.4% to +3.6% for the year 2000.

Since both annual growth rates for Niagara Regional Road 24 are the same, the change in year 2000 traffic is a result of the change in the base year traffic volumes. Growth in traffic along Regional Road 24 appears to have been below the projected growth for the ten year period, with the exception of the section between QEW and Regional Road #81 which has grown at a slightly faster pace than projected.

For Highway 20, the updated annual growth rate is only about 30% of the growth rate applied in Phase 4A; however, the new projected year 2000 traffic is 7.5% less than the Phase 4A projection. This indicates that the updated projected growth for this area is lower than the recent trends since 1983.

TABLE A.7

OWMC PHASE 4B - TRANSPORTATION

COMPARISON OF YEAR 2000 BACKGROUND TRAFFIC VOLUME FORECASTS FOR PHASE 4A UPDATE

LINK DESCRIPTION	BACKGROUND AADT			ANNUAL GROWTH RATES[3]		PROJECTED YEAR 2000 AADT		% CHANGE IN YEAR 2000 BACKGROUND TRAFFIC
	1983[1]	1984[2]	1985[2]	PHASE 4A	UPDATE	PHASE 4A[4]	UPDATE[5]	
A. Vineland Townline Road (NRR 24)								
1. QEW to NRR 81	7 190	7 800	N/A	4.1%	4.1%	14 320	14 830	+ 3.6%
2. NRR 81 to Moyer	6 990	6 800	N/A	5.1%	5.1%	16 210	15 070	- 7.0%
3. Moyer to NRR 73	6 990	6 800	N/A	5.1%	5.1%	16 210	15 070	- 7.0%
4. NRR 73 to Ninth	6 230	5 600	N/A	4.1%	4.1%	12 440	10 650	-14.4%
5. Ninth to NRR 216	5 420	5 650	N/A	2.9%	2.9%	8 800	8 920	+ 1.4%
6. NRR 216 to Hwy 20	4 580	N/A	N/A	2.9%	2.9%	7 440	7 450	+ 0.1%
B. Highway 20								
1. NRR 24 to Phase 4A site entrance	2 900	3 000	3 400	1.9%	0.58%	4 010	3 720	- 7.5%

NOTES:

1. Base year applied in Phase 4A
2. Base year applied in Phase 4B
3. Annual compound growth rate as calculated from the 10-year growth forecast prepared by road agencies
4. Extracted from Phase 4A Transportation Report (Dillon 1985)
5. Extracted from Table 3.4 in Chapter 3 (year 2000 forecast)

These changes to the background traffic for year 2000 will have an impact on the number of road users exposed to accidents or spills caused by OWMC generated transport movements. This will lead to a reduction in the road user risk indices applied in Phase 4A along the local and regional access route.

3.3 Conclusions

The following conclusions were reached regarding the comparison of Phase 4A and updated Phase 4B traffic data.

a) Recent trends in traffic growth on Niagara Regional Road 24 are generally less than the projected annual growth over the next 10 to 20 years. The exceptions are the sections between QEW and Regional Road #81 and, Ninth Avenue to Regional Road 216 which are growing at slightly faster rates than that projected.

b) The projected growth rate on Highway 20 is only 30% of the annual growth rate applied in Phase 4A, based on updated MTC forecast data.

c) The generally lower year 2000 traffic projections will reduce the values obtained for the road user risk indices developed in Phase 4A.

3.4 Recommendations

The reduced annual growth rate on the Highway 20 link is to be used in the Phase 4B analyses.

4. PROPORTION OF HEAVY AND MEDIUM TRUCKS IN TRAFFIC STREAM

4.1 Overview

During Phase 4A, the percent of trucks in the traffic stream was estimated based on four hours of counts in 1984 at two key locations along the Preferred Site local and regional access route. In Phase 4B these data were updated using two consecutive days of ten-hour count data during May 1986. The updated information contained a database five times the size of the Phase 4A analysis, in order to better estimate the truck volumes over the period of the day when OWMC generated vehicles are expected to be on the route.

This section presents a comparison of the two databases and discusses the impacts on the findings of Phase 4A.

4.2 Results of Analysis

Table A.8 presents comparative truck percentage data for the following two intersections where truck data were collected:

- Niagara Regional Road 24/81: north and south legs
- Niagara Regional Road 24/Highway 20: north and west legs

The comparison indicates that a higher proportion of trucks in the background traffic were noted during the 1986 counts than during Phase 4A. The most notable change was at the intersection of Regional Road 24 and Regional Road #81.

This change will not have an effect on frequency of spills or accident involvements along the access road; however, this will have a minor impact on the noise analysis for the access route. The increase in truck volumes in the background traffic will produce larger ambient traffic noise, and will somewhat diminish the impact of additional trucks generated by the facility.

TABLE A.8
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF PHASE 4A AND UPDATED TRUCK PROPORTIONS IN TRAFFIC STREAM

INTERSECTION		% HEAVY AND MEDIUM TRUCKS IN BACKGROUND TRAFFIC	
		PHASE 4A	UPDATE
Regional Road 24 at Regional Road 81:	north leg:	13	19
	south leg:	14	22
Regional Road 24 at Highway 20:	north leg:	18	22
	west leg:	15	16

4.3 Conclusions

The following conclusions are drawn based upon the comparative analysis of the percent of medium and heavy trucks in the background traffic:

1. The updated data involved a larger database than in Phase 4A, and indicates a larger proportion of heavy and medium trucks in the traffic stream than in Phase 4A.

2. The increase in proportion of trucks in background traffic will not have a direct effect on the spill and accident risk indices derived for the access route in Phase 4A.

3. The proportion of heavy and medium trucks in the traffic stream will impact the ambient noise levels and diminish the effect of additional truck traffic generation from the facility.

4.4 Recommendations

The percentage of medium and heavy trucks which were determined in the updated vehicle classification survey on the access route, should be applied in the Phase 4B Site Assessment work including transportation impact and noise analyses.

APPENDIX B

INVESTIGATION OF ACCIDENT TRENDS ON THE LOCAL AND REGIONAL ACCESS ROUTE 1982 to 1985

1. INTRODUCTION

This appendix describes the methodology, and findings of the analyses undertaken to investigate the accident trends along the local and regional access route to the Preferred Site. The road area covered in the investigations included NRR 24 from the QEW to Highway 20, and Highway 20 from Niagara Regional Road 24 to the Schram Road intersection. The analyses involved the following studies:

- a comparison of the frequency of unclear visibility conditions at accident locations on Regional Road 24 and for the entire Niagara Region;
- an examination of the accident characteristics on road sections with higher than average accident frequencies;
- an investigation into the location and characteristics of accidents involving trucks, school buses, and farm equipment along the access route.

To carry out this examination, it was necessary to gather 1983 to 1985 accident summary information from the Regional Municipality of Niagara (RMN) and the Ontario Ministry of Transportation and Communications (MTC). The RMN provided detailed accident characteristics summaries for each link of the access route, as well as regional summaries of accident experience for each township and city within the Regional Municipality of Niagara.

The results of this analysis conclude that there are a number of locations along the access route which are prone to accidents of certain characteristics. Chapter 6 (Monitoring) in the report discusses future data requirements and agency involvement to monitor conditions following the opening of the OWMC facility.

2. METHODOLOGY

The accident record summaries supplied by the two road agencies contain information on the accident characteristics which are useful to investigate accident trends. The following is a list of the types of information contained in the accident summaries which can be used to identify potential problem areas related to environmental conditions:

- ° Visibility
  - clear
  - rain
  - snow
  - fog
- ° Light
  - day
  - dawn
  - dusk
  - dark
- ° Pavement Surface
  - dry
  - wet
  - loose snow
  - packed snow
  - ice
  - mud
  - gravel

In addition, the summaries provide information on direction of travel, accident severity, and type of collision.

For the comparison of Niagara Region trends, only visibility and light conditions were considered since more than one pavement condition may exist at a given accident. In this comparison the proportion of accidents in each of the visibility conditions was calculated for the access route, and for the total Region of Niagara. The proportions were compared to determine if the trends on the access route differed significantly from the regional trends.

The next step was to examine the accidents along the access route to determine which locations produced the greater proportion of accidents under the different visibility conditions. This produces a list of location which may be prone to accidents under certain visibility and light condition.

The final step was to examine the trends in accidents along the access route which involved certain types of vehicles. These vehicle types included medium and heavy trucks, school buses and farm vehicles. The location and environmental conditions during these accidents were examined to identify possible accident prone locations for further analysis.

3. RESULTS OF ANALYSIS

This section presents the results of the accident trend analyses and identifies road sections which appear to be prone to accidents under certain conditions.

3.1 Comparison of Access Road to Other Areas Within Niagara Region

In order to determine the significance of visibility conditions on the accident frequency, the proportion of accidents on the access road for each of the visibility conditons was compared to the proportions for Niagara Region as a whole. This comparison indicated that accidents involving fog and snow visibility conditions form a larger proportion of the total accidents on the access road than is reflected in the Regional totals. This comparison is summarized in Table B.1.

TABLE B.1
OWMC PHASE 4B - TRANSPORTATION
COMPARISON OF ACCIDENTS INVOLVING DIFFERENT VISIBILITY CONDITIONS ON ACCESS ROAD, AND IN NIAGARA REGION

	Proportion(%) of accidents in each catagory for each year							
	1983		1984		1985		1983 - 85	
Visibility Condition	Access Route	Nia. Reg.	Access Route	Nia. Reg.	Access Route	Nia. Reg.	Access Route	Nia. Reg.
clear	67	79	63	74	68	72	66	74
rain	11	12	14	17	23	16	16	16
snow	18	8	13	9	7	11	13	9
fog	3	1	9	1	2	1	5	1

One of the factors which may account for this difference is the fact that the majority of the travel, and therefore accidents, in Niagara Region occurs along urban roadways where traffic conditions rather than visibility/weather conditions have a greater impact on traffic accidents. Therefore it is informative to compare the accident trends on the access road with the trends in the more rural areas of Niagara Region.

Table B.2 compares the trends in the six areas of Niagara Region to those of the access route from 1983 to 1985. Three of these areas are largely urban, and three are rural areas, and in total they account for some 80% of all the accidents which occurred in the region from 1983 to 1985. From this comparison it is seen that the proportion of accidents related to snow and fog along the access roads appear to be more in line with those of the rural areas of Niagara Region. The table also indicates that accidents in the urban centres will have a larger impact on the Niagara totals than the rural areas because a larger proportion of the accidents occur within the urban areas.

TABLE B.2
OWMC PHASE 4B - TRANSPORTATION
ACCIDENT TRENDS IN SIX AREAS OF NIAGARA REGION 1983 - 1985

	Proportion(%) of Accidents Related to Each Visibility Condition				% of total accidents for Niagara Region
AREA	Clear	Rain	Snow	Fog	
Niagara Region	74	16	9	1	= 100
Urban Centres					
St. Catharines	76	16	7	1	37
Niagara Falls	75	15	9	1	22
Welland	71	17	11	1	14
Urban Centres Sub Total					= 73
Rural Areas					
Lincoln	72	13	11	4	3
West Lincoln	73	10	13	4	2
Pelham	68	18	10	4	2
Rural Centres Sub Total					= 7
Access Road	66	16	13	5	1

This analysis has indicated that the access road has a similar proportion of snow and fog related accidents as occurred within other rural areas of Niagara Region. Therefore on the whole the access route does not appear to be any more severely affected by weather conditions than any other rural areas in the Niagara Region. However, an investigation of the differences in accident trends along the various sections of the access road is necessary to determine any sections which may be more vulnerable to visibility conditions.

3.2 Comparison of Trends on Different Sections of the Access Route

The object of this investigation is to identify sections of the access route which appear to have accident frequencies which are disproportionately affected by visibility conditions. The analysis is based upon the accident records for the years 1983 to 1985 as supplied by MTC and RMN.

Table B.3 summarizes the accident experience on the access route for each of the road sections which have been selected by the RMN for purposes of their road appraisal studies. This table indicates that the proportion of accidents taking place in rain, snow, or fog visibility conditions varies among all the road sections. The section of road which has the lowest proportion of accidents in non-clear visibility is the 3.8 kilometre section of road between QEW and Regional Road 81 in the Town of Vineland, and the 5.3 kilometer section of Highway 20 near the site entrance. The sections of road with the largest proportion of accidents in rain, snow, or fog are the 0.7 kilometer section between Regional Road 81 and Moyer Road, and the 4.1 kilometer section of road from Regional Road 216 to Highway 20. The 3.5 kilometer section of road from Regional Road 73 to Ninth Avenue has a large proportion of accidents during snow conditions, and the 3.0 kilometre section of road from Ninth Avenue to Regional Road 216 has a high proportion of incidents occurring during rain.

Based on the comparison carried out for the different sections of road along the access route a more detailed investigation of the accident experience was conducted to examine the location and nature of the extent in order to determine where mitigation or monitoring measures may be considered.

TABLE B.3
OWMC PHASE 4B - TRANSPORTATION
ACCIDENT TRENDS ALONG VARIOUS SECTIONS OF THE ACCESS ROUTE
1983 - 1985

Section	Length (km)	Acc.Freq/ Mill.Veh-km	Clear		Rain		Snow		Fog		Total Accident(%)
			#	%	#	%	#	%	#	%	
NRR 24											
QEW to NRR 81[1]	3.8	1.25	38	82.5	3	7.5	3	7.5	1	2.5	40 (22.5)
NRR 81 to Moyer[1]	0.7	3.19	8	47	6	35	1	6	2	12	17 (9.6)
Moyer to NRR 73	1.1	0.48	2	50	1	25	0	0	1	25	4 (2.2)
NRR 73 to Ninth	3.5	1.76	24	65	3	8	9	24	1	3	37 (20.8)
Ninth to NRR 216	3.0	1.68	17	60	8	29	1	4	2	7	28 (15.7)
NRR 216 to Hwy20	4.1	1.65	20	57	6	17	8	23	1	1	35 (19.7)
Hwy 20											
NRR 24 to Site	5.3	0.94	14	82	1	6	1	6	1	6	17 (9.6)
TOTALS	21.5	1.44	118	66%	28	16%	23	13%	9	5%	178 (100%)

Note:

1. These road sections are suburban/urban, and operating with reduced speed limits.

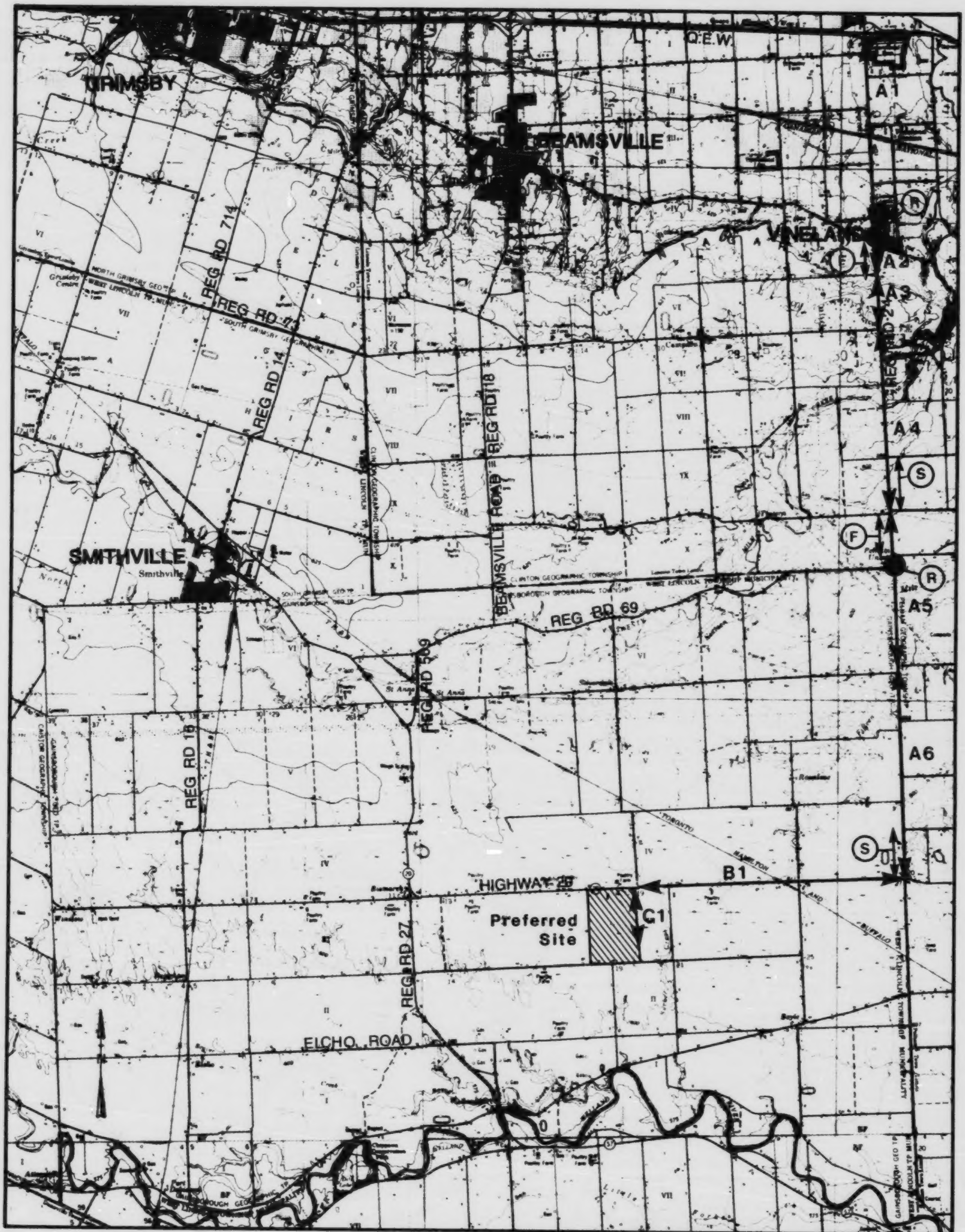
Table B.4 lists the road sections which were subject to these further investigations and the rationale for their selection. Two of the longer sections of road were not selected for further examination, namely Niagara Regional Road 24 from QEW to NRR 81, and Highway 20 from NRR 24 to the Preferred Site. These two roadway sections represent 42% of the total access road length, and 32% of the total three years of accidents. Also, they account for less than 17% of the accidents which occurred in visibility conditions other than clear. Therefore, visibility conditions are not likely to have a significant impact on the frequency of accidents on these road sections.

TABLE B.4
OWMC PHASE 4B - TRANSPORTATION
SECTIONS ON ACCESS ROUTE WHERE FURTHER ANALYSES OF ACCIDENT TRENDS ARE REQUIRED

ROAD SECTION AND LENGTH	RATIONALE FOR FURTHER INVESTIGATION
NRR 81 to Moyer (0.7km)	- short road section with higher incidence of rain and fog related accidents; 15% of all non-clear condition accidents
NRR 73 to Ninth (3.5km)	- higher incidence of snow related accidents; nearly 40% of all snow accidents
Ninth to NRR 216 (3.0km)	- above average number of rain and fog related accidents
NRR 216 to Hwy 20 (4.1km)	- above average proportion of snow related accidents; nearly 35% of all snow accidents

Upon examination of the accidents occurring in each of those sections, certain locations were identified as being more prone to accidents in non-clear visibility conditions than others. These sites were chosen due to the regularity of accident occurrence over the three-year period. Table B.5 lists locations along the access route which appear to be prone to accidents during periods of non-clear visibility, and the rationale for selection of these locations. This summary includes two intersections where rain visibility appears to be a factor in the accident frequency. The occurrence of fog during accidents on two other road sections, was less frequent than for snow and rain; however, the occurrence of fog appears to affect accident frequency on the approaches to the escarpment.

Figure B.1 identifies these possible accident prone areas along the access route.


Q.E.W.
GRIMSBY
BEAMSVILLE
VINELAND
A1
R
F
A2
A3
REG RD 24
REG RD 714
REG RD 12
REG RD 14
REG RD 18
BEAMSVILLE ROAD
A4
S
F
R
A5
SMITHVILLE
Smithville
REG RD 69
REG RD 569
REG RD 15
A6
S
B1
HIGHWAY 20
Preferred Site
C1
REG RD 27
ELCHO ROAD

OWMC Ontario Waste Management Corporation

Consultant

DILLON

KEY

Ⓡ rain

Ⓕ fog

Ⓢ snow

1 0 1 kilometers

PHASE 4B
LOCATIONS WITH HIGHER PROPORTION OF ACCIDENTS IN UNCLEAR VISIBILITY 1983 - 85

FIGURE B:1

TABLE B.5
OWMC PHASE 4B - TRANSPORTATION
LOCATIONS ON ACCESS ROUTE WHICH MAY BE PRONE TO ACCIDENTS DURING NON-CLEAR VISIBILITY

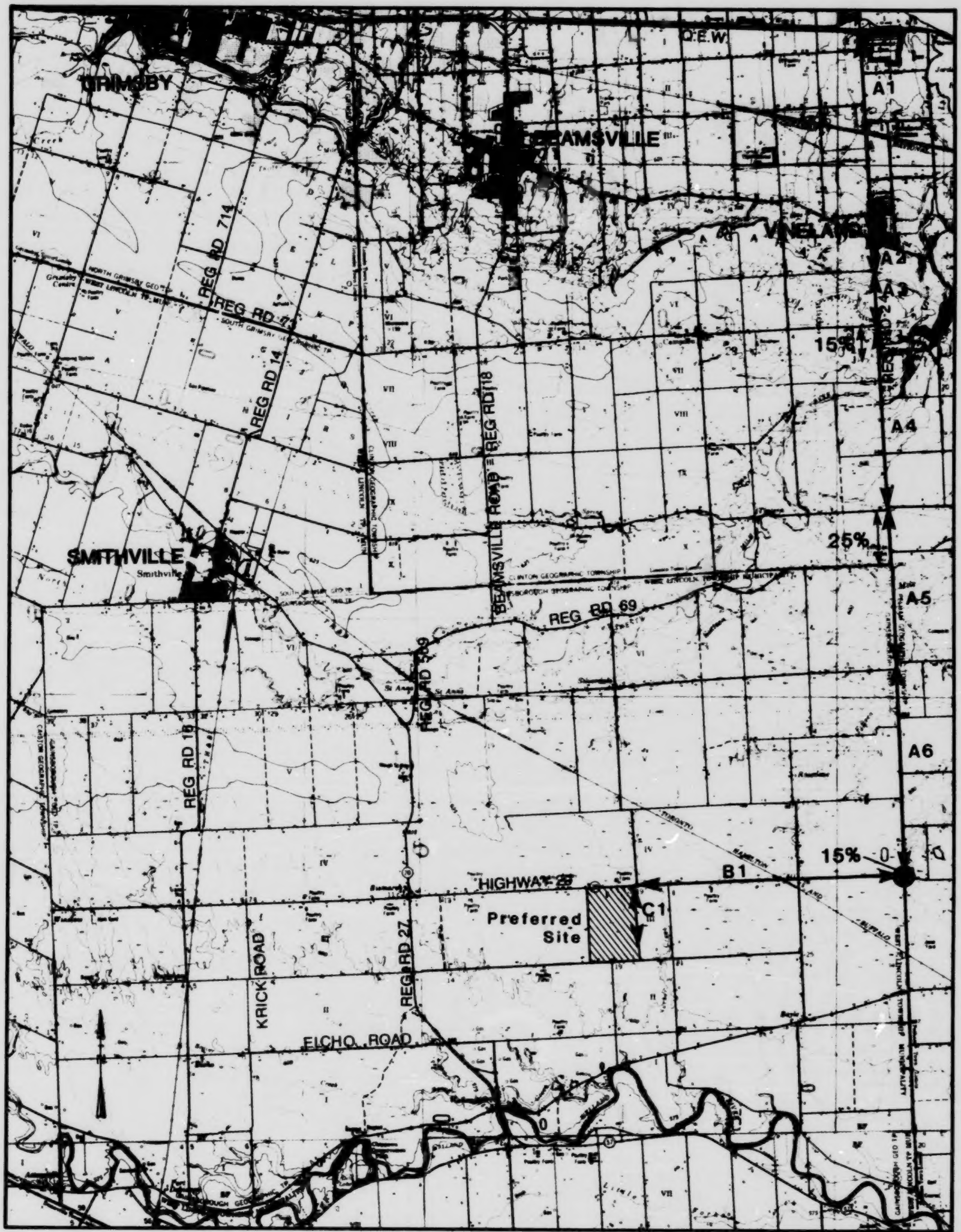
LOCATION	VISIBILITY CONDITION	RATIONALE
1. Intersection of NRR 24 and NRR 81	- Rain	- 35% of all accidents occurred during rain (6 of 17) - all rain accidents involved N/B vehicles, no trucks - one third were rear end collisions
2. NRR 81 to Moyer	- Fog	- 40% of accidents on link related to fog visibility, both in same year (2 of 5) - N/B vehicles involved in both; no trucks
3. NRR 669 to Ninth	- Snow	- 60% of all accidents were in snow visibility (4 of 7) - three involved N/B vehicles; one heavy truck - half were one vehicle accidents
4. Ninth to NRR 69N	- Fog	- 18% of accidents involved fog visibility (2 of 11) - both involved S/B vehicles; both involved truck/semi trailer; at night; injurious

TABLE B.5
OWMC PHASE 4B - TRANSPORTATION
LOCATIONS ON ACCESS ROAD WHICH MAY BE PRONE TO ACCIDENTS DURING NON-CLEAR VISIBILITY
(continued)

LOCATION	VISIBILITY CONDITION	RATIONALE
5. Intersections of NRR 69N and NRR 69S with NRR 24	- Rain	- 40% of accidents were in rain visibility (4 of 10) - three involved S/B vehicles; one heavy truck - three were rear end, other one vehicle - all daylight occurances; all property damage only
6. Tice Road to Hwy20	- Snow	- 30% of accident in snow visibility (6 of 20) - two thirds were one vehicle accidents; one heavy truck - two thirds were in dark - two injurious accidents

3.3 Trends of Accidents Involving Heavy Trucks/Buses, School Buses, and Farm Equipment

This section documents the results of the analysis carried out to examine the frequency and nature of truck, bus, and farm equipment accident involvements along the access road to the Preferred Site. The purpose of this examination is to identify road sections which appear to be prone to accidents involving these types of vehicles and any potential mitigation measures that may be feasible to reduce the accident frequencies.


Q.E.W
GRIMSBY
BEAMSVILLE
VINELAND
A1
A2
A3
15%
A4
25%
A5
A6
15%
0
B1
C1
HIGHWAY 20
Preferred Site
REG RD 714
REG RD 12
REG RD 14
REG RD 18
BEAMSVILLE ROAD
REG RD 69
SMITHVILLE
REG RD 15
KRICK ROAD
REG RD 27
ELCHO ROAD
REG RD 24

OWMC Ontario Waste Management Corporation

Consultant

DILLON

1 0 1 kilometers

PHASE 4B

LOCATIONS WITH HIGHER PROPORTION OF TRUCK ACCIDENTS 1983-85

FIGURE B:2

The need for this special investigation was established during the course of meetings with public groups who identified a concern with accidents involving these vehicles types.

3.1.1 Trucks and buses

From 1983 to 1985 there were 21 trucks or buses (non-school) involved in 20 accidents along the access route between the QEW and the site entrance (total of 178 accidents reported; as per Table B.3). Two of these accidents were fatal, while equal proportions of the remainder were property damage or produced personal injury. The two fatal accidents and nearly half of the personal injury accidents occurred at night, and involved collisions with passenger vehicles. Table B.6 summarizes the accident experience involving trucks and buses by accident location.

The three years of truck/bus accident data provided a very limited database for deriving any meaningful conclusions regarding location where truck/bus accidents could be mitigated. However, Table B.7 identifies three general locations which account for eleven (55%) of the twenty truck accident involvements for the three years. Of these eleven accidents, six (55%) were fatal or injurious, four (36%) occurred at night, and six (55%) occurred in unclear visibility conditions. These locations are identified in Figure B.2.

The lack of a sizable database precludes the formulation of any final and supportable conclusions concerning truck and bus accidents. Monitoring future trends within the three specific areas identified in Table B.7 is desirable.

TABLE B.6
OWMC PHASE 4B - TRANSPORTATION
SUMMARY OF TRUCK & BUS ACCIDENTS ON ACCESS ROAD: 1983 - 1985

ACCIDENT DESCRIPTION	ACCIDENT LOCATIONS														
	GREEN LANE TO FIRST	JOHN TO SECOND	CLAUSE TO CULP	AT CULP	FIRST TO 81	AT 73	73 TO 75	BETH TO SEVENTH	669 TO NINTH	NINTH TO 69N	AT 69N	AT 69S	AT HWY 20	24 TO SCHRAM	TOTAL
Direction and Vehicle Type[3]															
- Tractor Trailer	S		N	N	S		N	N		S N	N	N	N S	W W	14
- Dump or Bus		N		W		S N			N			S E	S		8
- Passenger Vehicle	S	N	S		S	E N		S	N	S S	S	S	S S	W W	16
Type of Accident															
- Rear End		X				X			X			X	X		5
- Sideswipe										X				X	3
- Head On								X		X	X		X		4
- Angle				X		X						X		X	4
- One Vehicle							X						X		2
- Other	X		X												2
Light															
- Day	X	X		X	X	X	X	X	X			X X	X X X	X	14
- Dawn															0
- Dark			X			X				X X	X			X	6
Visibility															
- Clear	X	X	X	X			X			X		X	X X	X X	11
- Rain					X	X						X			3
- Snow								X	X				X		3
- Fog						X				X	X				3
Road Surface															
- Dry	X	X	X				X			X	X	X X	X X	X X	12
- Wet					X	X X		X					X		5
- Snow				X					X						2
- Ice										X					1
Severity															
- Fatal										X				X	2
- Personal Injury		X	X	X		X		X		X	X	X	X		9
- Property Damage	X				X	X	X		X			X	X X	X	9

TABLE B.7
OWMC PHASE 4B - TRANSPORTATION
LOCATIONS WHERE MAJORITY OF (55%)TRUCK/BUS[1] ACCIDENTS OCCURRED ON ACCESS ROAD 1983-85

LOCATION	ACCIDENT EXPERIENCE
1. Ninth Avenue to NRR 69S	- 25% of all truck accidents occur along this one kilometre section (5 of 20)
2. NRR 73 to NRR 75	- 15% of all truck accidents occur here (3 of 20)
3. Intersection of Highway 20/ NRR 24	- 15% of all truck accidents occur here (3 of 20)

NOTES:

1. None of the bus accidents involved school buses

3.3.2 School buses and farm equipment

The 1983 to 1985 data indicates that there were no accidents along the access road involving school buses, while two accidents occurrences involved farm equipment. Table B.8 provides a description of conditions for the accidents involving farm equipment.

TABLE B.8
OWMC - PHASE 4B - TRANSPORTATION
ACCIDENTS INVOLVING FARM EQUIPMENT ON ACCESS ROUTE 1983-1985

1. Green Lane to First Avenue	(09/84) - clear; dark; dry - S/B rear end; passenger vehicle - property damage only
2. Intersection of NRR 69S	(07/83) - clear; day; dry - N/B tractor trailer; E/B farm equipment; angle collision - injurious

The inability to secure full accident reports, due to their confidential treatment, poses a major difficulty in determining the probable contributing causes to the farm equipment related accidents. In the case of the rear end accident under nighttime conditions, it is probably that a high relative speed difference and the quality of rear lighting/reflectorization may have been involved. The second accident which resulted in an angle collision at a stop controlled intersection under ideal daytime conditions suggests a serious driver error was involved.

This investigation indicates that school bus, and farm equipment accidents do not appear to be a significant problem along the access route. However, it does serve to emphasize the truck related accident occurrences in the area of NRR 69N and NRR 69S.

4. CONCLUSIONS

The accident database of 178 accident occurrences over the period 1983 through 1985 on the 21.5 kilometer local and regional access route, is of insufficient size upon which to develop a mitigation program. However, it has served to identify potential accident prone areas where further monitoring would be beneficial to discern real problems and possible corrective actions.

Preliminary conclusions arising from these investigations include:

a) Weather and visibility conditions on the access route at the time of accident occurrences, appears to be typical of that reflected in other rural areas of the Niagara Region.

b) Roadway sections and intersections which should be monitored for higher than average incidence of rain, snow or fog visibility condition accidents include (also see Figure B.1):

- Intersection of NRR 24 and 81 - Rain
- NRR 81 to Moyer Road - Fog
- NRR 669 to Ninth Avenue - Snow
- Ninth Avenue to NRR 69N - Fog
- Intersections of NRR 69N and 69S with NRR 24 - Rain
- Tice Road to Highway 20 - Snow

c) Eleven of the 20 truck/bus accident involvements (55%) occurred within three road sections/intersections along the access route including (also see Figure B.2):

- Ninth Avenue to NRR 69S
- NRR 73 to RR 75
- Intersection of Highway 20/NRR 24

d) School bus operation on the access route has demonstrated a high degree of safety in that no accident occurrences were reported over the three-year period.

e) Farm equipment movements on the access route has been relatively safe. Of the two accidents reported, one occurred in the Green Lane to First Avenue section and the second at the intersection of NRR 24/69S.

5. RECOMMENDATIONS

Monitoring of conditions including future accidents should be maintained to discern the need for mitigative actions, particularly along those road sections and at intersections which have demonstrated a higher than average frequency of accident occurrence.

APPENDIX C

PHASE 4B FACTORS AND INDICATORS APPLIED
FOR SITE ASSESSMENT RISKS
AND IMPACTS ON THE
LOCAL AND REGIONAL ACCESS ROUTE

OWMC PHASE 4B: FACTORS FOR SITE ASSESSMENT - TRANSPORTATION

FACTOR GROUPING: TRANSPORTATION RISK	**FACTOR:** TRANSPORTATION SPILL FREQUENCY: POTENTIAL RISK TO HUMAN AND ENVIRONMENTAL RECEPTORS ALONG THE LOCAL AND REGIONAL ACCESS ROADS DUE TO SPILLS RESULTING FROM THE TRANSPORT OF SPECIAL WASTES, AND ADDITIVES AND REAGENTS

DEFINITION OF FACTOR: The predicted frequency of spills which may pose a potential risk to human and environmental receptors during the transportation of special waste, and additives and reagents to the preferred site along the preferred local regional access routes; based upon the fifth year of site operation, receipt of 150 000 t/a of special waste and the process additives and reagents to treat this quantity.

RATIONALE/SIGNIFICANCE: The local and regional access road system typically carries the largest concentration of vehicles accessing the site. As a result those receptors on, or adjacent to the routes are exposed to the largest risks associated with spills of materials involving the truck transport movements from the material source areas to the treatment facility. Spill frequency data may be combined with receptor data to assess the spill risk. Two spill frequency indicators are defined for this factor.

INTERPRETATION/METHODOLOGY: Spill frequency prediction is a component of risk assessment to be undertaken by others. The calculation is the product of the 1995 forecast of OWMC generated one-way truck transport movements on each road link carrying special wastes, and process additives and reagents; and the individual frequencies of spill occurrence based on exposure parameters unique to each of the indicators.

FACTOR GROUPING: TRANSPORTATION RISK	**FACTOR:** TRANSPORTATION SPILL FREQUENCY: POTENTIAL RISK TO HUMAN AND ENVIRONMENTAL RECEPTORS ALONG THE LOCAL AND REGIONAL ACCESS ROADS DUE TO SPILLS RESULTING FROM THE TRANSPORT OF SPECIAL WASTES, AND ADDITIVES AND REAGENTS

INDICATOR 1: Frequency of motor vehicle accident-related spills for year five operation (1995) involving the processing of 150 000 t/a of special wastes and the required process additives and reagents.

DEFINITION: Vehicles transporting special wastes, and additives and reagents to the site from material source areas, may become involved in a motor vehicle accident producing a spill while travelling along the local and regional access route.

RATIONALE/SIGNIFICANCE: In-transit spillage resulting from an accident event on the local and regional access route may pose a risk to human health and the environment. The minimization of spills is desirable and when spills occur, countermeasures are required to minimize effects to human and environmental receptors.

SOURCES OF INFORMATION:

- Ontario Ministry of Transportation and Communications and Regional Municipality of Niagara all-vehicle accident rates on access road links.
- Research data on the relationship of all vehicle accident rates, medium and heavy truck accident frequency and involvement rates.
- Spill frequency as a function of accident involvements based on Pilorusso Research Associates investigation conducted for OWMC.
- Forecasts of OWMC generated truck movements transporting special wastes, and process additives and reagents, and assignment of vehicle movements to the local and regional access route.

COMMENTS/ASSUMPTIONS/LIMITATIONS: Spill occurrence as a result of an accident event would only occur while a loaded truck is travelling to the OWMC treatment facility; transport movements involving unloaded trucks are not considered.

Road link accident rates and the vehicle involvement rates in accidents have been assumed to remain relatively constant during the analysis period as has been demonstrated over the past 15 years.

Truck transport movements of other site related materials, i.e. granular and surplus clay, are excluded from the spill analysis, as much materials are not dangerous goods and therefore do not pose a direct risk to human health or the environment.

OWMC PHASE 4B: FACTORS FOR SITE ASSESSMENT - TRANSPORTATION

FACTOR GROUPING:	FACTOR:
TRANSPORTATION RISK	TRANSPORTATION SPILL FREQUENCY: POTENTIAL RISK TO HUMAN AND ENVIRONMENTAL RECEPTORS ALONG THE LOCAL AND REGIONAL ACCESS ROADS DUE TO SPILLS RESULTING FROM THE TRANSPORT OF SPECIAL WASTES, AND ADDITIVES AND REAGENTS

INDICATOR 2: Frequency of non-motor vehicle accident-related spills resulting from transport equipment failure while in-transit in the loaded mode. This spill frequency is based upon year five operation (1995) involving the processing of 150 000 t/a of special wastes and the required process additives and reagents.

DEFINITION: Vehicles transporting special wastes, and additives and reagents to the site from material source areas, may suffer from equipment failure producing an in-transit spill while travelling along the local and regional access route.

RATIONALE/SIGNIFICANCE: In-transit spillage resulting from transport vehicle equipment failure producing a loss of containment along the local and regional access route may pose a risk to human health and the environment. The minimization of such spills is desirable and when spills occur, countermeasures are required to minimize effects to human and environmental receptors.

SOURCES OF INFORMATION:

- Spill frequency rates for in-transit spills due to equipment failure based on Pilorusso Research Associates investigation conducted for OWMC.
- Forecasts of OWMC generated truck movements transporting special wastes, and process additives and reagents, and assignment of vehicle movements to the local and regional access.

COMMENTS/ASSUMPTIONS/LIMITATIONS: Spill occurrence as a result of equipment failure producing a loss of containment would only occur while a loaded truck is travelling to the OWMC treatment facility; transport movements involving unloaded trucks are not considered.

Truck transport movements of other site related materials, i.e. granular and surplus clay, are excluded from the spill analysis, as much materials are not dangerous goods and therefore do not pose a direct risk to human health or the environment.

OWMC PHASE 4B: FACTORS FOR SITE ASSESSMENT - TRANSPORTATION

FACTOR GROUPING:	**FACTOR:**
TRANSPORTATION RISK	TRANSPORTATION RISK DUE TO ACCIDENT INVOLVEMENT: RISK TO HUMAN HEALTH ON THE LOCAL AND REGIONAL ACCESS ROADS DUE TO ACCIDENTS INVOLVING OWMC GENERATED TRANSPORT

DEFINITION OF FACTOR: The probability of transport accidents and the potential risk to human health represents the relative risk of transporting wastes, additives and reagents, and clay and granular materials along the local and regional access route. The calculation is based on the annual all-vehicle accident rates along the preferred route used to travel from the QEW to the Preferred Site.

This factor uses the 5th year of site operation and involves the transport of 150 000 tonnes/annum of special wastes, the required process additives and reagents, and clay and granular materials.

RATIONALE/SIGNIFICANCE: This factor is one of a number of risk assessment components which will be applied to the site assessment process to determine risks associated with the site operation.

The probability of an accident is dependent upon the characteristics of the routes used, and the actual accident experience.

INTERPRETATION/METHODOLOGY: By using 1983 to 1985 data on all-vehicle accident involvement rates along the local and regional access routes, it is possible to estimate the number of accident involvements which will involve trucks transporting OWMC process materials. This estimation will be based on the current statistical relationship between all-vehicle accident rates and truck accident involvement.

The frequency percentage for the fatal and injury accident involvements by specific vehicle types is then applied to the total estimated number of accident involvements to estimate the indicator values for risk to human health.

FACTOR GROUPING:	FACTOR:
TRANSPORTATION RISK	TRANSPORTATION RISK DUE TO ACCIDENT INVOLVEMENT: RISK TO HUMAN HEALTH ON THE LOCAL AND REGIONAL ACCESS ROADS DUE TO ACCIDENTS INVOLVING OWMC GENERATED TRANSPORT

INDICATOR 1: Risk to human health associated with OWMC generated traffic involved in fatal accidents.

DEFINITION: The risk to human health is represented by the calculated frequency at which OWMC generated transport movements may be involved in fatal accidents.

RATIONALE/SIGNIFICANCE: An accident involving OWMC site generated transport may pose a risk to road users. Total accident involvement by OWMC generated transport is calculated as the product of the estimated 1995 OWMC movements on each access road link, the 1983-85 accident involvement rate on the link and the link length. The fatal accident frequency proportion for the specific vehicle type of accident involvements, is then applied to predict the fatal accident frequency.

SOURCES OF INFORMATION:

- Ontario Ministry of Transportation and Communications, and Regional Municipality of Niagara accident involvement data, AADT's and growth factors by road links.
- Research on the relationship of all-vehicle accidents to truck transport accident involvement.
- Forecasted truck movements of special wastes, additives/reagents, and clay/granular material on the preferred access routes between the QEW and the Preferred Site entrance.
- Forecasted employee vehicle movements occurring on certain preferred access route links.
- Data excerpted from Ministry of Transportation and Communications Road Safety Annual Reports (Accident Facts) for 1983-85 on type of vehicle involve in fatal accidents.

COMMENTS/ASSUMPTIONS/LIMITATIONS: It has been assumed that the 1983 to 1985 all-vehicle accident rates on road links will remain relatively constant as has been demonstrated over the past 15 years.

The year 1995 AADT was estimated based on the growth factors supplied by the road agencies and was applied to the 1983 and 1984 AADT's.

All OWMC generated truck transport movements occurring on the local and regional access routes are included in the fatal accident frequency calculation. However, employee transport movements were only considered on the two road links in proximity to the site.

FACTOR GROUPING: TRANSPORTATION RISK	**FACTOR:** TRANSPORTATION RISK DUE TO ACCIDENT INVOLVEMENT: RISK TO HUMAN HEALTH ON THE LOCAL AND REGIONAL ACCESS ROADS DUE TO ACCIDENTS INVOLVING OWMC GENERATED TRANSPORT

INDICATOR 2: Risk to human health associated with OWMC generated traffic involved in fatal accidents.

DEFINITION: The risk to human health is represented by the calculated frequency at which OWMC generated transport movements may be involved in fatal accidents.

RATIONALE/SIGNIFICANCE: An accident involving OWMC site generated transport may pose a risk to road users. Total accident involvement by OWMC generated transport is calculated as the product of the estimated 1995 OWMC generated movements on each access road link, the 1983-85 accident involvement rate on the link and the link length. The fatal accident frequency proportion for the specific vehicle type of accident involvements, is then applied to predict the fatal accident frequency.

SOURCES OF INFORMATION:

- Ontario Ministry of Transportation and Communications, and Regional Municipality of Niagara accident involvement data, AADT's and growth factors by road links.
- Research on the relationship of all-vehicle accidents to truck transport accident involvement.
- Forecasted truck movements of special wastes, additives/reagents, and clay/granular material on the preferred access routes between the QEW and the Preferred Site entrance.
- Forecasted employee vehicle movements occurring on certain preferred access route links.
- Data excerpted from Ministry of Transportation and Communications Road Safety Annual Reports (Accident Facts) for 1983-85 on type of vehicle involve in fatal accidents.

COMMENTS/ASSUMPTIONS/LIMITATIONS: It has been assumed that the 1983 to 1985 all-vehicle accident rates on road links will remain relatively constant as has been demonstrated over the past 15 years.

The year 1995 AADT was estimated based on the growth factors supplied by the road agencies and was applied to the 1983 and 1984 AADT's.

All OWMC generated truck transport movements occurring on the local and regional access routes are included in the fatal accident frequency calculation. However, employee transport movements were only considered on the two road links in proximity to the site.

OWMC PHASE 4B: FACTORS FOR SITE ASSESSMENT - TRANSPORTATION

FACTOR GROUPING:	**FACTOR:**
TRANSPORTATION IMPACT	TRANSPORTATION IMPACT ON THE LOCAL AND REGIONAL ACCESS ROUTE RESULTING FROM THE INCREASE IN OWMC GENERATED TRAFFIC VOLUMES

DEFINITION OF FACTOR: Construction at the OWMC site (year 1990) and site operations based upon processing of 150 000 t/a of special wastes (year 1995) will generate new vehicle trips on the local and retional access route between the QEW and the site. The transport impacts of this additional trip generation is assessed using two indicators.

RATIONALE/SIGNIFICANCE: This factor is one of a number of impact factors used to assess the effects of OWMC site generated traffic in relation to future background traffic on the access route. The change in estimated traffic volumes could lead to capacity deficiencies on various segments of the access route and/or adversely impact the operating levels-of-service at existing signalized intersections.

The combination of background traffic on road links plus the change in demand resulting from site construction and operations is applied to determine the need for improvements in the existing access route infrastructure.

INTERPRETATION/METHODOLOGY: Baseline forecasts of future background traffic volumes on road links and at signalized intersections were made for the analysis years 1990 and 1995, without consideration of OWMC transport demands.

Forecasts of OWMC traffic generation were then made for material and workforce/employee movemtns as a result of construction activities during 1990 and operations in 1995 (based on processing of 150 000 t/a of special wastes). These new movements were then assigned to appropriate road links and combined with the baseline forecasts to produce a forecast including OWMC generation.

The surcharged baseline forecast is then compared with the baseline forecast to assess the impact of change in terms of the selected indicators.

FACTOR GROUPING:	**FACTOR:**
TRANSPORTATION IMPACT	TRANSPORTATION IMPACT ON THE LOCAL AND REGIONAL ACCESS ROUTE RESULTING FROM THE INCREASE IN OWMC GENERATED TRAFFIC VOLUMES

INDICATOR 1: Effects of OWMC traffic volumes surcharge on predicted baseline values for each access road link.

DEFINITION: OWMC traffic generation will increase the travel demand on each link of the local and regional access route. The potential effect of this surcharge is assessed in terms of change in design hourly volumes and for an average workday during the years 1990 and 1995.

RATIONALE/SIGNIFICANCE: Significant changes in traffic demand levels on sections of the access route may adversely impact the operating level-of-service and necessitate roadway cross sectional improvements to adhere to recognized standards and criteria for these roadways. Features that may be directly affected include such items as lane widths, shoulder width, road surface type, or the need to add additional traffic lanes to improve capacity and operating level-of-service.

OWMC site traffic generation is not uniform throughout a typical workday. Thus, the effects of the surcharge are evaluated on the design hourly basis as well as for a 24-your workday period.

SOURCES OF INFORMATION:

- Ontario Ministry of Transportation and Communications and Regional Municipality of Niagara and Township of West Lincoln provided data on current AADT's, projected growth rates for a 10-year period and future design hour volumes on each road link.
- Data collection on four road sections provided information at the 1986 level on the percent of medium and heavy trucks.
- Baseline forecasts of future conditions were made for each road section in 1990 and 1995.
- OWMC site traffic generation was calculated for each analysis year and assigned to access road links on a design hour and total workday basis.

COMMENTS/ASSUMPTIONS/LIMITATIONS: It has been assumed that a uniform compound annual growth would occur on each link of the access route, which over ten years would be equivalent to the ten-year growth factor predicted by the respective road authorities.

OWMC generated trucking was assigned to the entire local and regional access route; however, employee traffic assignments were made only to the last two road links approaching the site. This limitation was necessary as no home-base distribution was available for future employee trips.

OWMC PHASE 4B: FACTORS FOR SITE ASSESSMENT - TRANSPORTATION

FACTOR GROUPING: TRANSPORTATION IMPACT	**FACTOR:** TRANSPORTATION IMPACT ON THE LOCAL AND REGIONAL ACCESS ROUTE RESULTING FROM THE INCREASE IN OWMC GENERATED TRAFFIC VOLUMES

INDICATOR 2: Effects of OWMC traffic volumes surcharge on predicted baseline values for each access road link.

DEFINITION: OWMC traffic generation will increase the a.m. or p.m. peak hourly demands at signlaized intersections may adversely impact intersection operations and reduce the level-of-service of operations. This may lead to the need to modify the traffic signal cycle length, phase timing allocations or require the addition of traffic lanes on the intersection approaches to maintain an acceptable level-of-operating service. Consequently, the effects of the OWMC volume surcharge to predicted baseline conditions is assessed for the two operating years and daily time periods.

RATIONALE/SIGNIFICANCE: Significant changes in a.m. or p.m. peak hourly demands at signalized intersections may adversely impact intersection operations and reduce the level-of-service of operations. This may lead to the need to modify the traffic signal cycle length, phase timing allocations or require the addition of traffic lanes on the intersection approaches to maintain an acceptable level-of-operating service. Consequently, the effects of the OWMC volume surcharge to predicted baseline conditions is assesed for the two operating years and daily time periods.

SOURCES OF INFORMATION:

- Ontario Ministry of Transportation and Communications and Regional Municipality of Niagara provided eight-hour baseline turning movement volume counts at the Highway 20/NRR 24 and NRR 24/81 intersections, respectively. They also provided ten-year growth factors for the intersection approach links.
- Future baseline forecasts at each intersection were made for the years 1990 and 1995.
- OWMC site generated traffic volumes were predicted for the two analysis years and daily peak hours.

COMMENTS/ASSUMPTIONS/LIMITATIONS: OWMC generated trucking was assignable to the two intersections analyzed. An assignment of construction workforce trips produced a distribution between Highway 20 and NNR 24 north. The remainder of trips on the west approach to the intersection were distributed equally for the movementsl west/east and west/south.

As no distribution was available for site employee trips, beyond the Schram Road to NRR 24 link of Highway 20, the total approach volume surcharge was distributed equally to the three directions available at the Highway 20/ NRR 24 intersection. These assumptions were applied to produce the OWMC traffic volume surcharge at this intersection.

FACTOR GROUPING: TRANSPORTATION IMPACT	**FACTOR:** TRANSPORTATION IMPACT ON THE LOCAL AND REGIONAL ACCESS ROUTE RESULTING FROM THE INCREASE IN OWMC GENERATED TRAFFIC VOLUMES

DEFINITION OF FACTOR: The addition of OWMC generated volumes on the access road system will produce an impact on each road link due to a potential increase in small annual number of accident involvement occurrences.

RATIONALE/SIGNIFICANCE: To assess the impact of the change in annual accident involvements, as a result of OWMC site development (year 1990) and site operations (year 1995), the added number of OWMC generated traffic accident involvements is calculated and compared to the link accident involvements for predicted baseline conditions. For purposes of impact assessment, the estimated frequency of OWMC generated vehicle accident involvements for all types of accidents is developed. This differs from the transportation risk factor approach which considered only the accident events which produced fatalities or injuries producing a human health risk.

INTERPRETATION/METHODOLOGY: The total accident involvement frequency is developed for each road link using the vehicle kilometers of travel on the link and the link's accident involvement rate which is based on historical data. The rate used is based on 1983 to 1985 all-vehicle accident involvement rates for each link. The rate is applied to the product of the predicted baseline year traffic volumes on each link and the link length.

For the calculation of OWMC generated traffic accident involvements, a separate involvement rate is applied to the medium and heavy truck component of the site traffic generation, whereas the all-vehicle rate is applied in calculating workforce or employee trip accident involvements.

OWMC PHASE 4B: FACTORS FOR SITE ASSESSMENT - TRANSPORTATION

FACTOR GROUPING: TRANSPORTATION IMPACT	**FACTOR:** TRANSPORTATION IMPACT ON THE LOCAL AND REGIONAL ACCESS ROUTE RESULTING FROM THE INCREASE IN OWMC GENERATED TRAFFIC VOLUMES

INDICATOR 1: Change in annual accident involvements due to additional transport movements generated by OWMC operations.

DEFINITION: The change in impact on the local and regional access roads is represented by the annual increase in accident involvements resulting from the additional traffic generation of OWMC site operations.

RATIONALE/SIGNIFICANCE: Total annual accident involvement by OWMC generated transport is calculated as the product of the annual site generated traffic volume occurring on each access road link, and the historic accident involvement rate on each link. Individual involvement rates are applied to the truck transport movements and employee/workforce trips.

Specific analyses were undertaken for the assumed 1990 construction year, and the 1995 operations year when it is assumed that the site would process 150 000 t/a of special wastes.

Similar calculations are made to estimate the annual frequency of accident involvements for baseline traffic on each access road link during the 1990 and 1995 analysis years. This calculation is based on the product of the road link background traffic AADT and the all-vehicle accident involvement rate.

The impact of OWMC operations on the local and regional access route is then assessed by combining the results of these calculations.

SOURCES OF INFORMATION:

- Ontario Ministry of Transportation and Communications and Regional Municipality of Niagara accident involvement data, AADT's and growth factors by road links.
- Research on the relationship of all-vehicle accidents to truck transport accident involvement.
- Forecasted truck movements of special wastes, additives/reagents, and clay/granular material on the preferred access routes between the QEW and the Preferred Site entrance.
- Forecasted employee vehicle movements occurring on certain preferred access routes links.
- Forecasted basline AADT's on each access road link for 1990 and 1995 background traffic year.

COMMENTS/ASSUMPTIONS/LIMITATIONS: It has been assumed that 1983 to 1985 all-vehicle accident rates on road links will remain relatively constant as has been demonstrated over the past 15 years.

The year 1990 and 1995 AADT were estimated based on the growth factors supplied by the road agencies and was applied to the 1983 and 1984 AADT's.

All OWMC transport movements occurring on the local and regional access routes are included in the accident frequency calculation. However, employee transport movements were only considered on the two road links in proximity to the site.

APPENDIX D

DETERMINATION OF THE PREFERRED SITE ACCESS REQUIREMENTS

NOTE: This appendix presents information in support of Report Chapter 4 Section 4. Specific items included are:

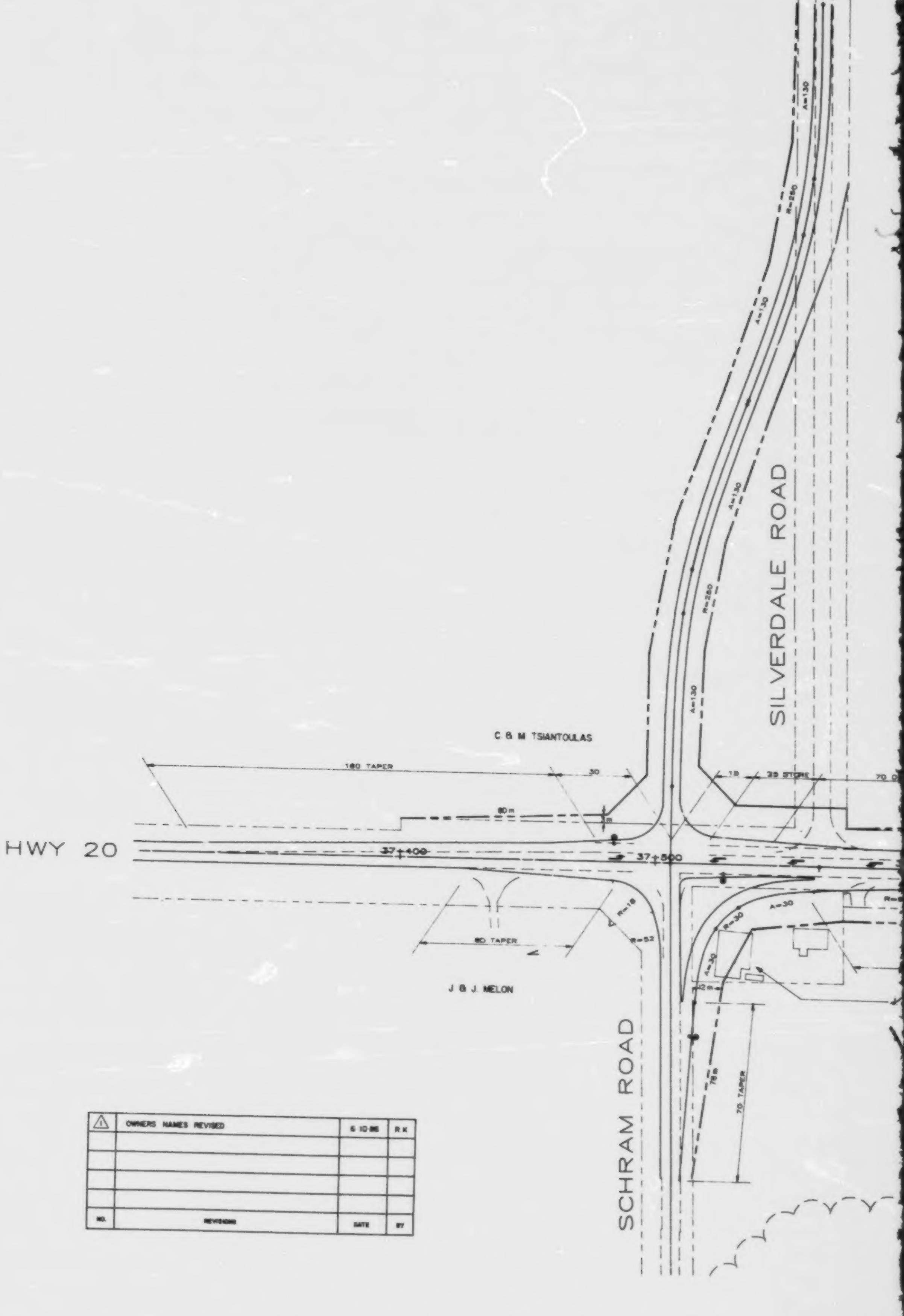
- design options evaluated for the improvement of the Highway 20/Schram Road/Silverdale Road intersection
- design option for a westerly site access including preliminary design for improvement to Highway 20
- geometric design proposals for site entrances from existing public roads
- information transmitted to the Ministry of Transportation and Communications and Township of West Lincoln
- minutes of meetings held with potentially affected property owners
- responses received from the consultation process

DESIGN OPTIONS EVALUATED
FOR SITE ACCESS FROM SCHRAM ROAD

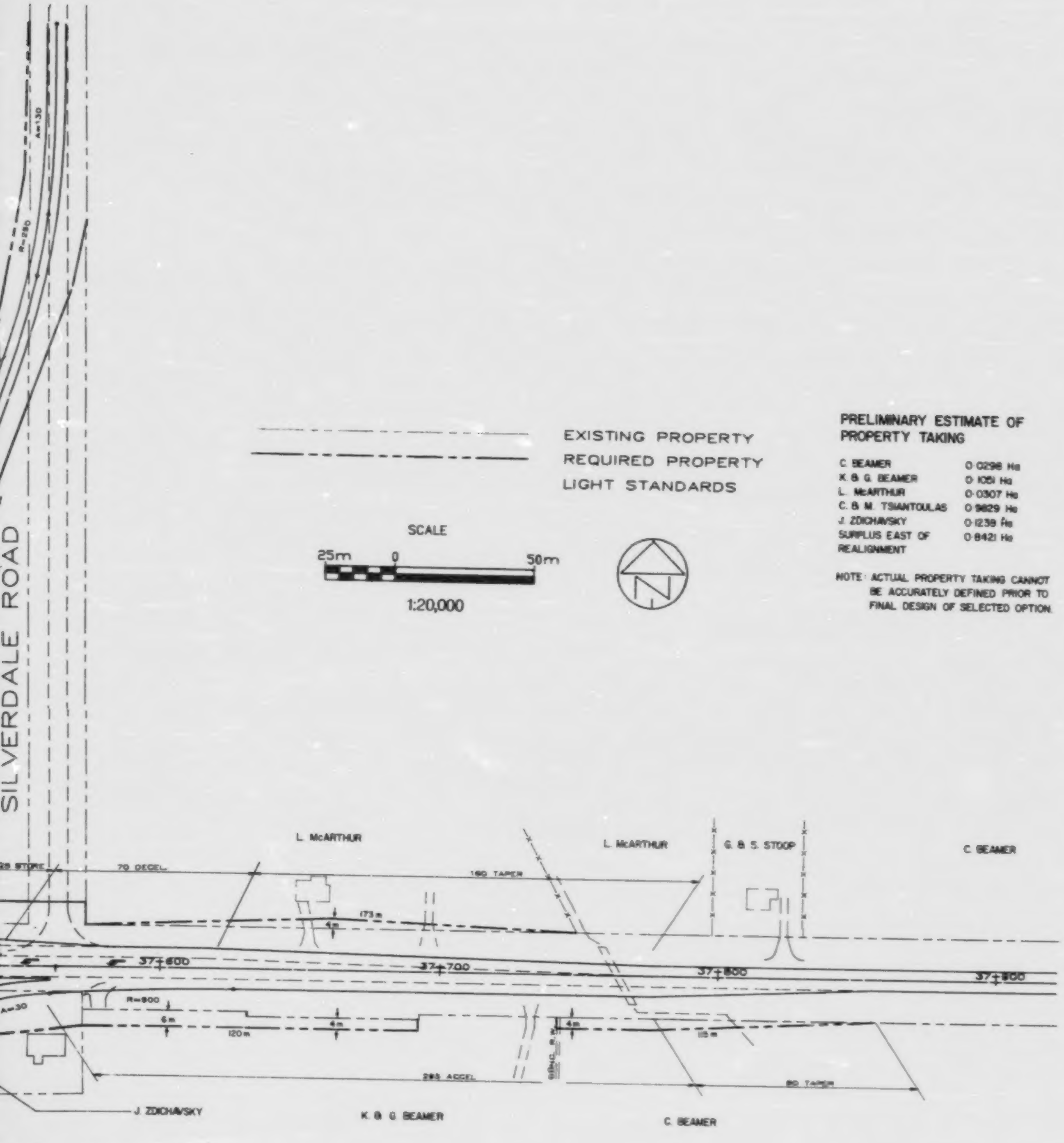
NOTE: Estimates of the Cost and Property Acquisition Requirements

Pre-preliminary cost estimates were prepared for design options (Figures D-1 and D-2) as an input to the comparative evaluation. Common assumptions were used in the construction cost estimates for each option. The Silverdale Road relaignment (Figure D-1) was estimated at $350 000 while the Schram Road relaignment was estimated at $355 000.

Preliminary estimates of the property acquisition needs were also provided. The total area of acquisition for Figure D-1 totals 2.5 ha. Both area acquisitions are subject to adjustment during final design of the selected option.


HWY 20
SILVERDALE ROAD
SCHRAM ROAD
C & M TSIANTOULAS
J & J. MELON
180 TAPER
30
18
39 STORE
70 D
80m
3m
37+400
37+500
80 TAPER
R=18
R=52
A=130
R=250
A=30
R=30
12m
78m
70 TAPER

1	OWNERS NAMES REVISED	6 10 86	R K
NO.	REVISIONS	DATE	BY


A=130
R=280
SILVERDALE ROAD
L. McARTHUR
L. McARTHUR
G. B. S. STOOP
C. BEAMER
29 STORE
70 DECEL.
160 TAPER
173 m
4m
37+600
37+700
37+800
37+800
A=30
R=800
6m
120m
4m
4m
115 m
285 ACCEL
80 TAPER
J. ZDICHAVSKY
K. B. G. BEAMER
C. BEAMER
SCALE
25m
0
50m
1:20,000
N

EXISTING PROPERTY
REQUIRED PROPERTY
LIGHT STANDARDS

PRELIMINARY ESTIMATE OF PROPERTY TAKING

C. BEAMER	0·0298 Ha
K. B. G. BEAMER	0·1051 Ha
L. McARTHUR	0·0307 Ha
C. B. M. TSIANTOULAS	0·9829 Ha
J. ZDICHAVSKY	0·1239 Ha
SURPLUS EAST OF REALIGNMENT	0·8421 Ha

NOTE: ACTUAL PROPERTY TAKING CANNOT BE ACCURATELY DEFINED PRIOR TO FINAL DESIGN OF SELECTED OPTION.

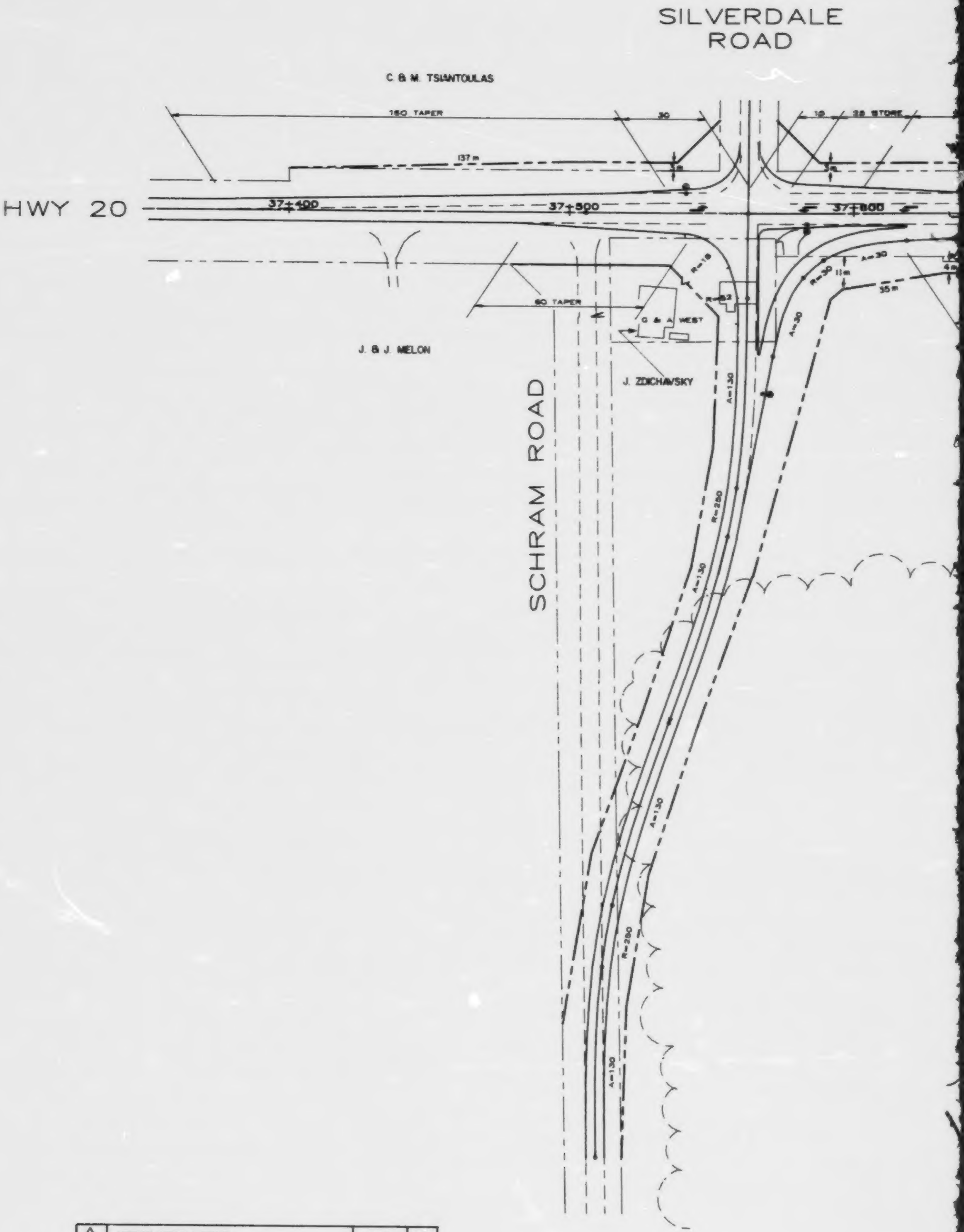
O. W. M. C.

SILVERDALE ROAD REALIGNMENT

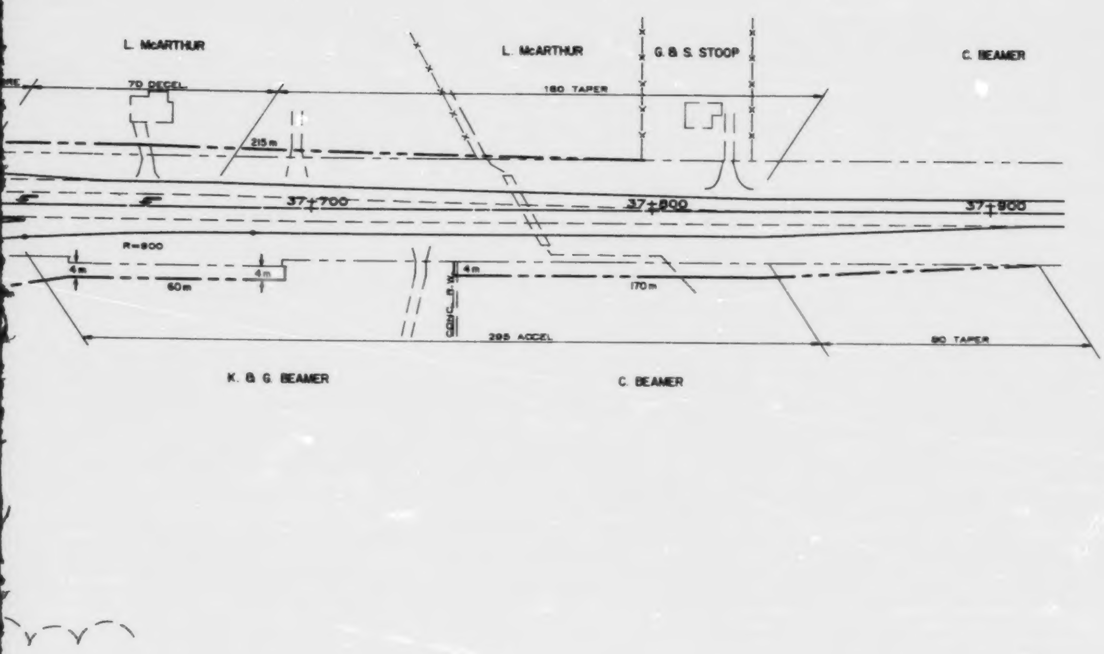
FIGURE D-1

DILLON

DRWG No 9924–13–SK 4


SILVERDALE ROAD
C. & M. TSIANTOULAS
150 TAPER
30
10
28 STORE
137 m
3 m
HWY 20
37+400
37+500
37+600
R=18
R=32
60 TAPER
G. & A. WEST
J. & J. MELON
J. ZDICHAVSKY
SCHRAM ROAD
A=130
A=30
R=30
11 m
35 m
4 m
R=250

NO.	REVISIONS	DATE	BY
⚠	OWNERS NAMES REVISED	6-10-86	R.K.


L. McARTHUR
L. McARTHUR
G. & S. STOOP
C. BEAMER
RE
70 DECEL
180 TAPER
215 m
37+700
37+800
37+900
R=900
4m
60m
4m
4m
CONC. R.W.
170m
295 ACCEL
90 TAPER
K. & G. BEAMER
C. BEAMER

EXISTING PROPERTY
REQUIRED PROPERTY
● LIGHT STANDARDS

SCALE
25m 0 50m
1:20,000

PRELIMINARY ESTIMATE OF PROPERTY TAKING

C. BEAMER	0·0512 Ha
K. & G. BEAMER	0·9793 Ha
L. McARTHUR	0·0471 Ha
C. & M. TSIANTOULAS	0·0365 Ha
J. ZDICHAVSKY	0·2139 Ha
SURPLUS WEST OF REALIGNMENT	0·9220 Ha

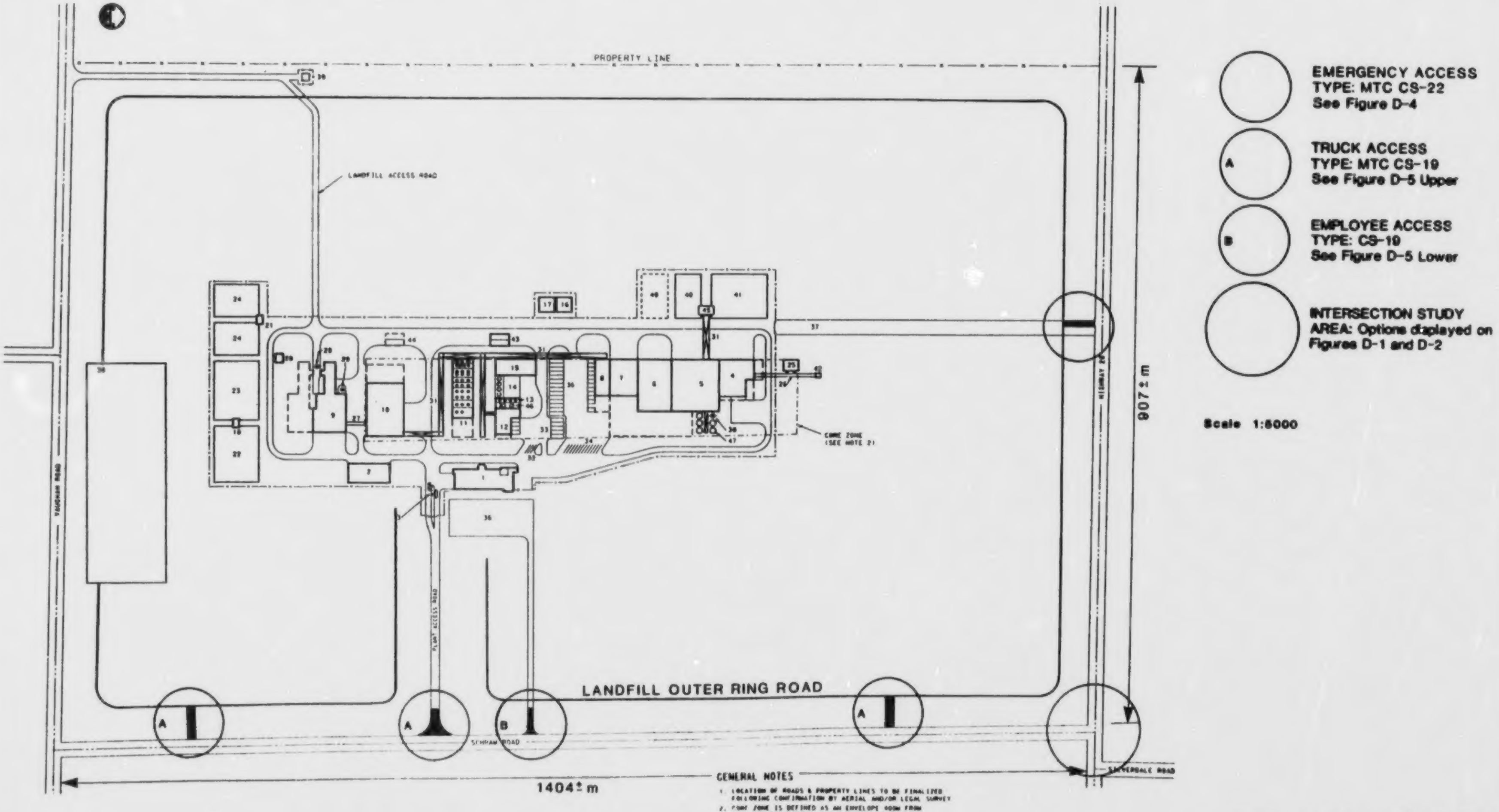
NOTE: ACTUAL PROPERTY TAKING CANNOT BE ACCURATELY DEFINED PRIOR TO FINAL DESIGN OF SELECTED OPTION.

O. W. M. C.
SCHRAM ROAD REALIGNMENT

FIGURE D-2

DILLON

DRWG No 9924–13–SK5


PROPERTY LINE
LANDFILL ACCESS ROAD
LANDFILL OUTER RING ROAD
PLANT ACCESS ROAD
SCHRAM ROAD
VAUGHAN ROAD
HIGHWAY 20
SILVERDALE ROAD
CONE ZONE (SEE NOTE 2)
907± m
1404± m
A
B
EMERGENCY ACCESS
TYPE: MTC CS-22
See Figure D-4
TRUCK ACCESS
TYPE: MTC CS-19
See Figure D-5 Upper
EMPLOYEE ACCESS
TYPE: CS-19
See Figure D-5 Lower
INTERSECTION STUDY
AREA: Options displayed on
Figures D-1 and D-2
Scale 1:5000

GENERAL NOTES

1. LOCATION OF ROADS & PROPERTY LINES TO BE FINALIZED FOLLOWING CONFIRMATION BY AERIAL AND/OR LEGAL SURVEY
2. CONE ZONE IS DEFINED AS AN ENVELOPE 400m FROM THE SITE BOUNDARIES, AS ESTABLISHED BY OWMC

Proposed Locations for Site Access from Schram Road

FIGURE D-3

MINISTRY
OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

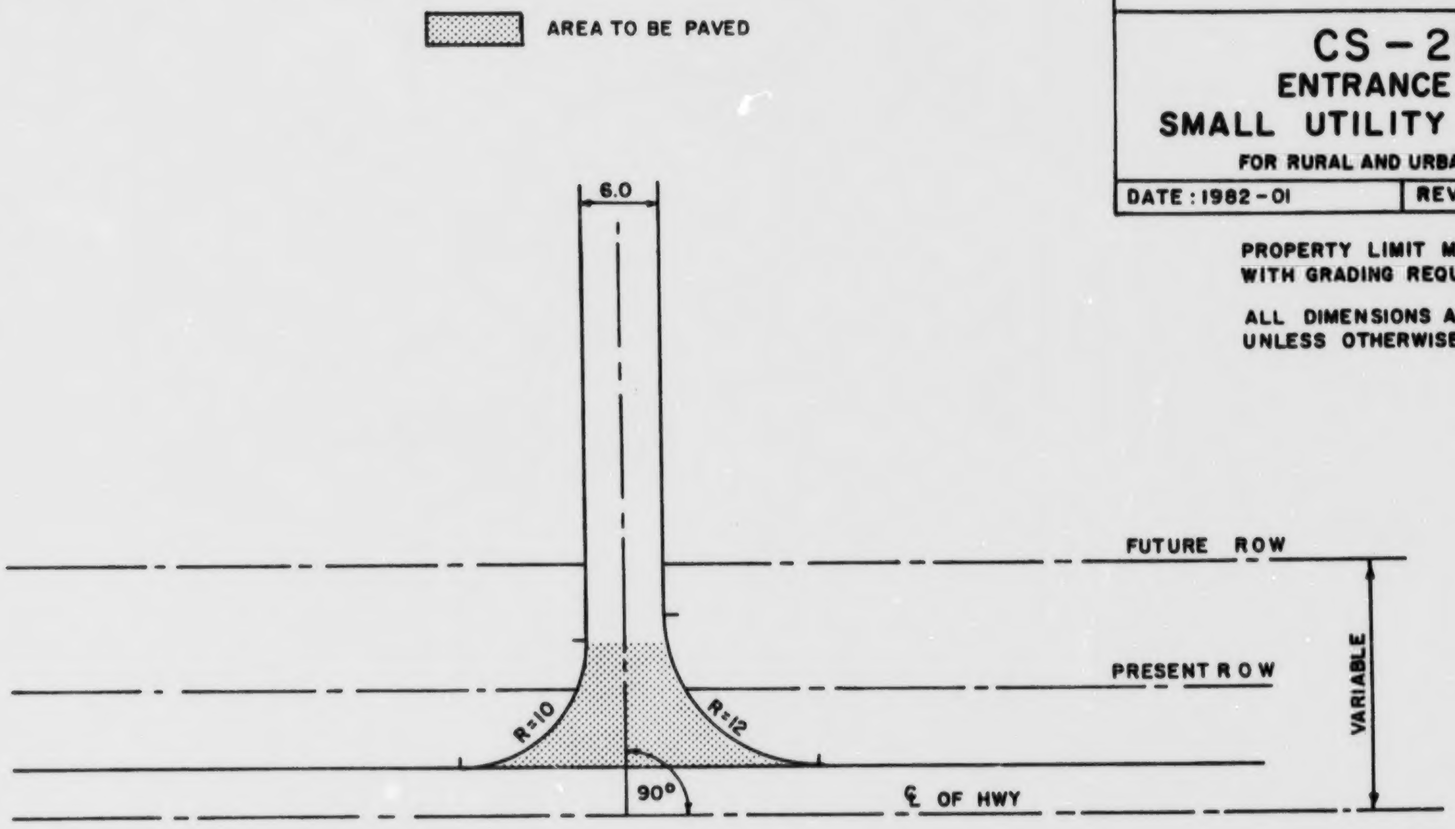
CS – 22
ENTRANCE TO SMALL UTILITY STATION

FOR RURAL AND URBAN AREAS

DATE : 1982 - 01	REV:

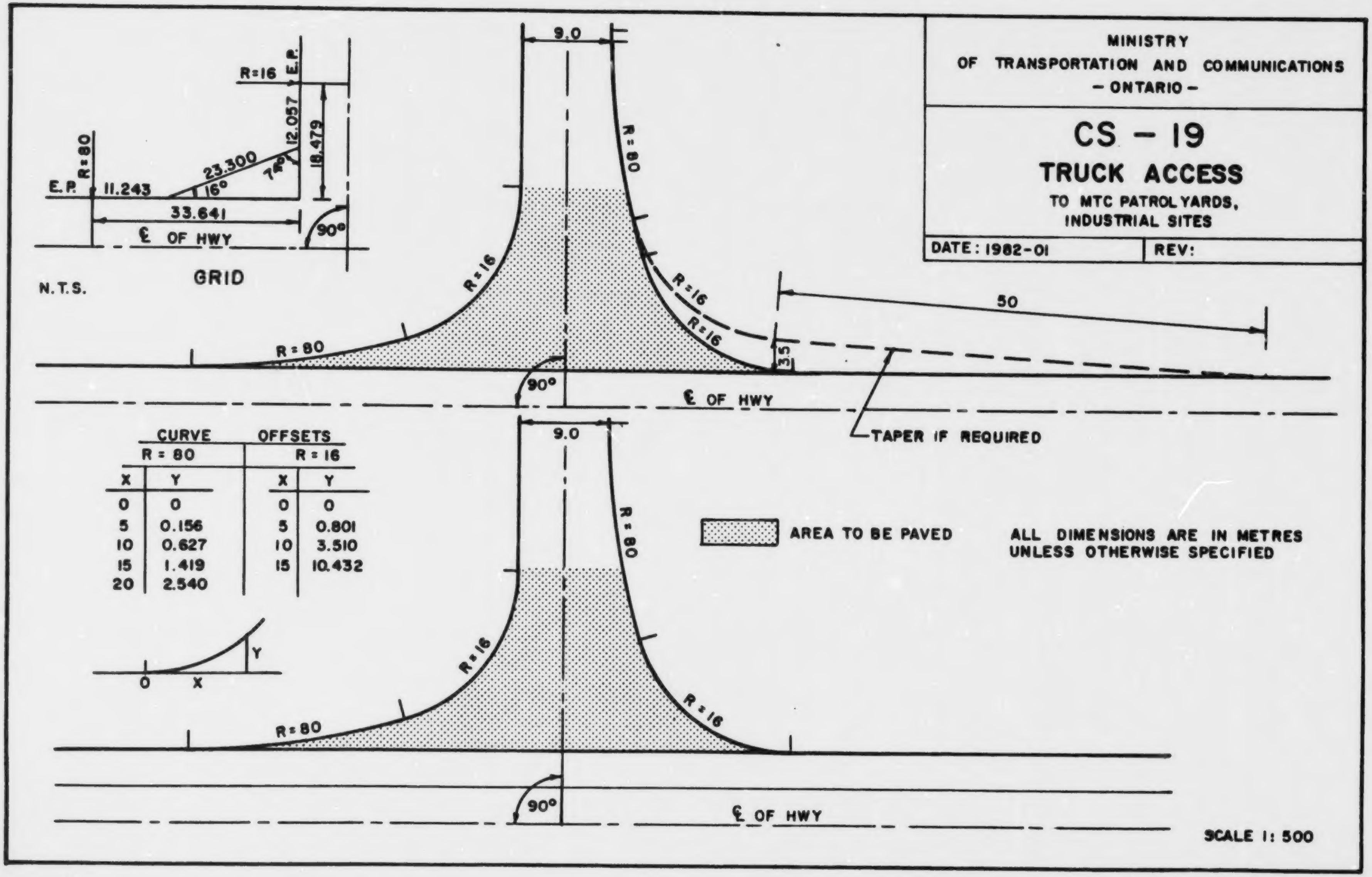
PROPERTY LIMIT MAY VARY
WITH GRADING REQUIREMENTS

ALL DIMENSIONS ARE IN METRES
UNLESS OTHERWISE SPECIFIED


AREA TO BE PAVED
6.0
FUTURE ROW
PRESENT R O W
VARIABLE
R=10
R=12
90°
℄ OF HWY

SCALE 1:500

FIGURE D-4



MINISTRY
OF TRANSPORTATION AND COMMUNICATIONS
- ONTARIO -

CS - 19

TRUCK ACCESS

TO MTC PATROLYARDS,
INDUSTRIAL SITES

DATE: 1982-01 REV:

CURVE OFFSETS R = 80 X	CURVE OFFSETS R = 80 Y	R = 16 X	R = 16 Y
0	0	0	0
5	0.156	5	0.801
10	0.627	10	3.510
15	1.419	15	10.432
20	2.540		

▨ AREA TO BE PAVED

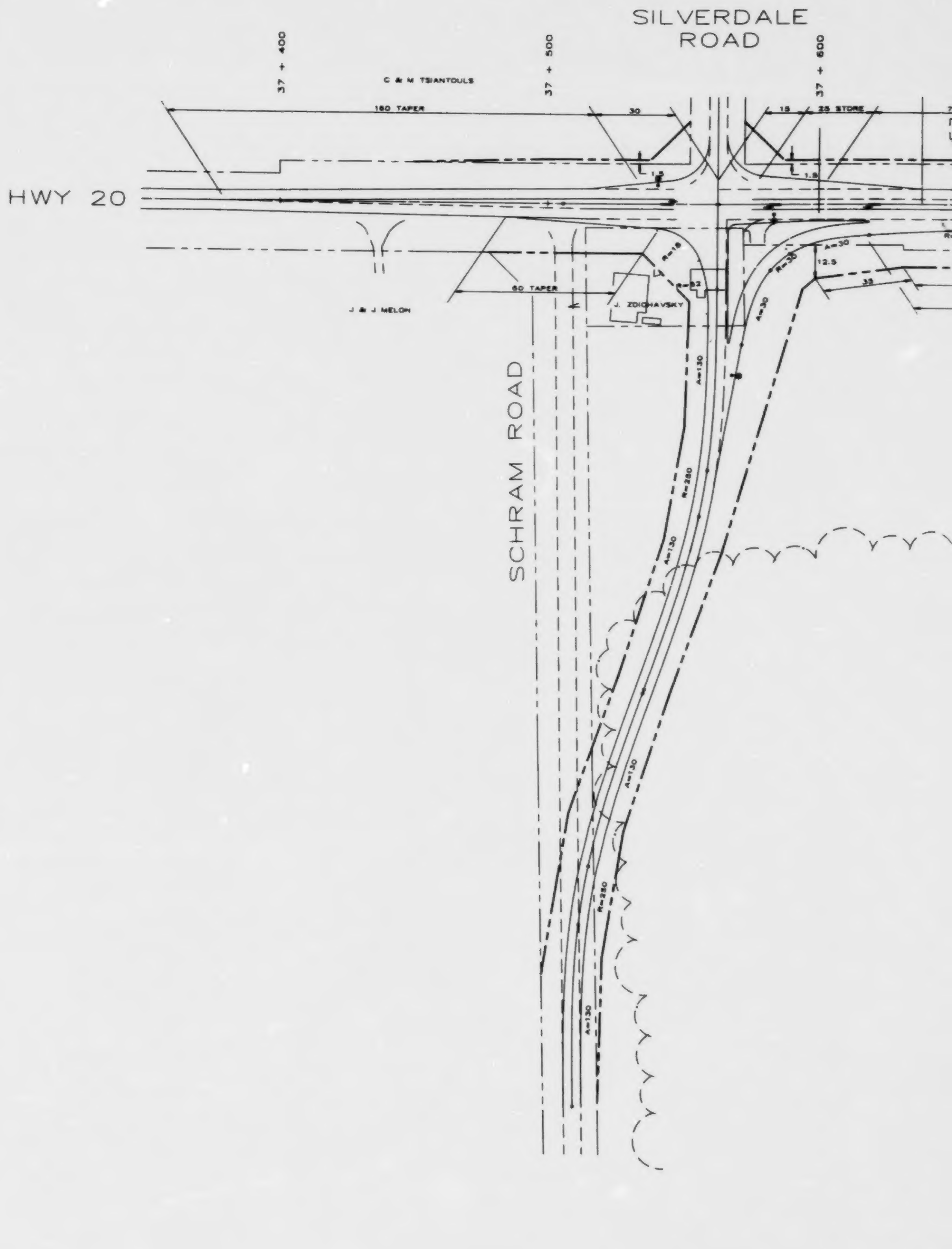
ALL DIMENSIONS ARE IN METRES
UNLESS OTHERWISE SPECIFIED

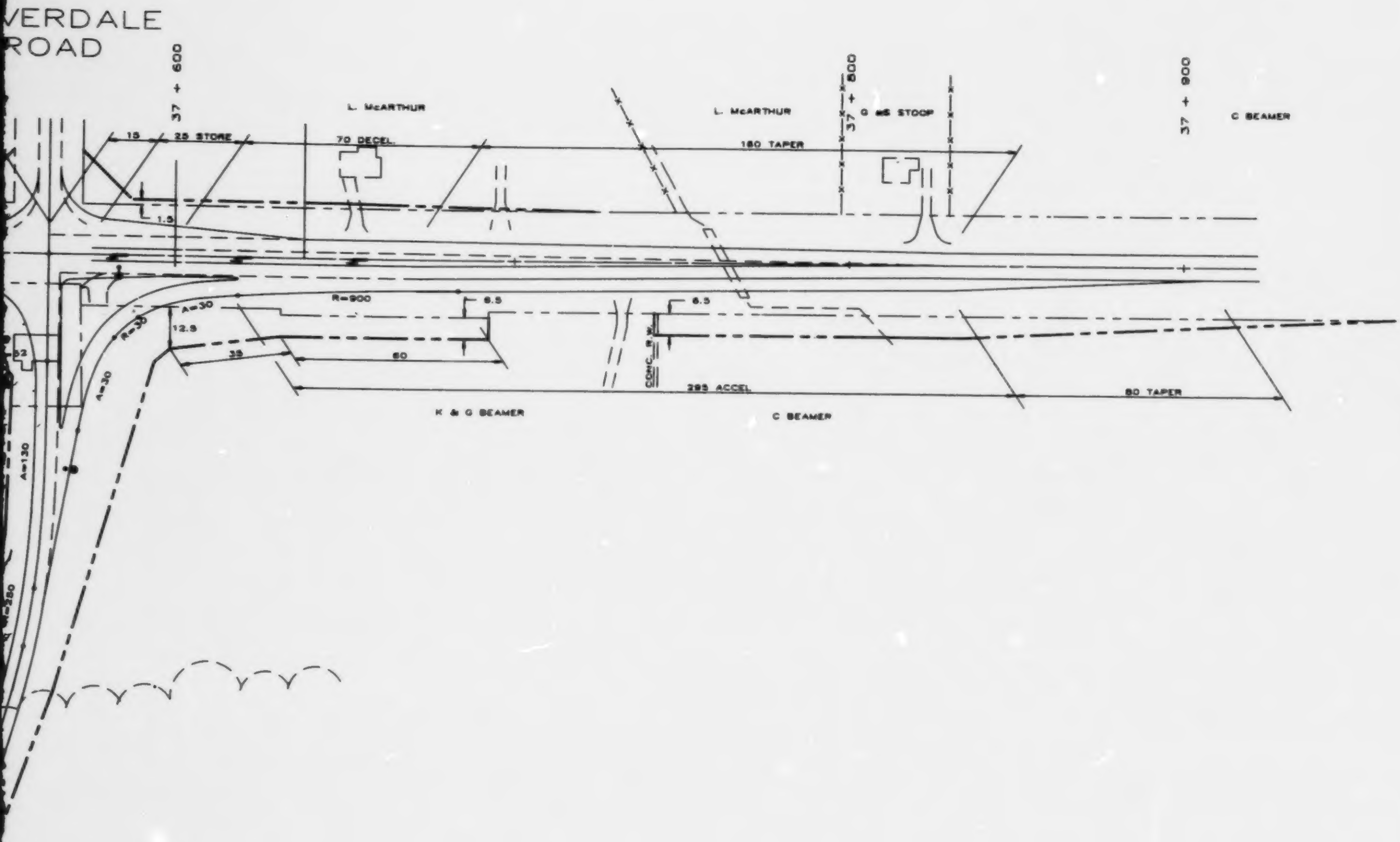
SCALE 1: 500

E.P.
R=80
11.243
23.300
16°
7°
12.057
18.479
R=16
E.P.
33.641
℄ OF HWY
90°
GRID
N.T.S.
9.0
R=16
R=80
R=16
R=16
35
50
℄ OF HWY
TAPER IF REQUIRED
9.0
R=80
R=16
R=80
R=16
90°
℄ OF HWY
O
X
Y

FIGURE D-5

MODIFIED PRELIMINARY DESIGN
PLAN FOR SCHRAM ROAD REALIGNMENT
TO MITIGATE CONCERNS IDENTIFIED
IN THE MINISTRY OF TRANSPORTATION
AND COMMUNICATIONS LETTER OF
12 NOVEMBER 1986. FIGURE D-6 REPLACES
FIGURE D-2 AND IS THE PREFERRED
DESIGN BASED ON THE RESULTS OF
A COMPARATIVE EVALUATION OF ALL
SITE ACCESS OPTIONS.


SILVERDALE ROAD
37 + 400
37 + 500
37 + 600
C & M TSIANTOULS
180 TAPER
30
15
25 STORE
1.5
1.5
HWY 20
R=18
R=32
R=30
A=30
12.5
35
60 TAPER
J & J MELON
J. ZDICHAVSKY
SCHRAM ROAD
A=130
R=250
A=130
A=130
R=250
A=130


VERDALE
ROAD
37 + 600
L. McARTHUR
15
25 STORE
70 DECEL.
1.5
L. McARTHUR
180 TAPER
37 + 800
G &S STOOP
37 + 900
C BEAMER
R=900
6.5
6.5
A=30
R=30
12.5
35
60
CONC. R.W.
295 ACCEL
80 TAPER
K & G BEAMER
C BEAMER
22
A=30
A=130
R=250

EXISTING PROPERTY
REQUIRED PROPERTY
LIGHT STANDARDS

PRELIMINARY ESTIMATE OF PROPERTY TAKING

C BEAMER	0.0929 Ha
K & G BEAMER	1.0367 Ha
L. McARTHUR	0.0289 Ha
C & M TSIANTOULAS	0.0217 Ha
J. ZDICHAVSKY	0.2139 Ha
SURPLUS WEST OF REALIGNMENT	0.9220 Ha

SCALE

NOTE: ACTUAL PROPERTY TAKING CANNOT BE ACCURATELY DEFINED PRIOR TO FINAL DESIGN OF SELECTED OPTION

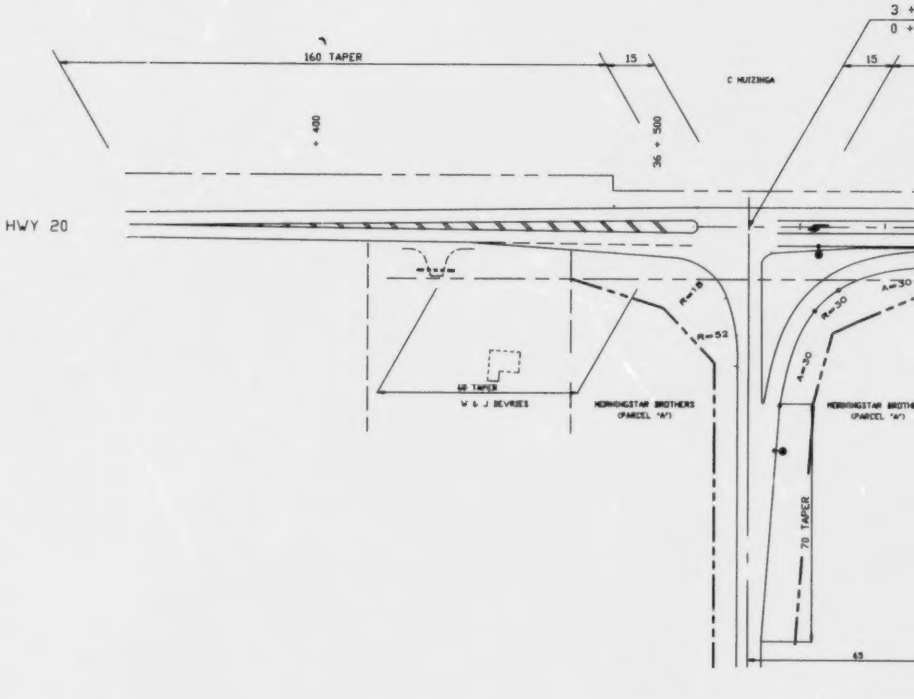
O. W. M. C.
SCHRAM ROAD REALIGNMENT

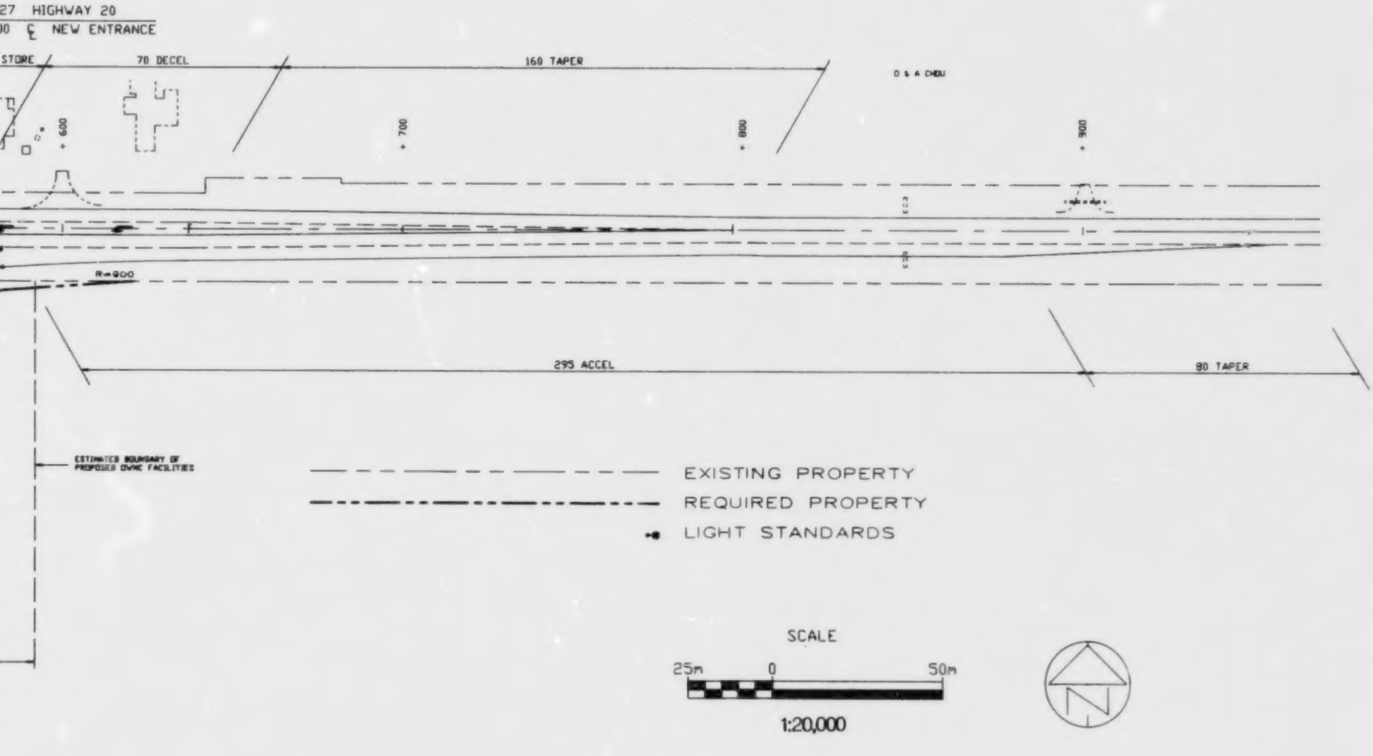
FIGURE D-6

DILLON

DRWG No 9924-13-SK6

DESIGN OPTION EVALUATED
FOR ACCESS TO SITE FROM NEW
ENTRANCE WEST OF SITE


160 TAPER
15
C HUIZINGA
3 +
0 +
15
+ 400
36 + 500
HWY 20
R=18
R=52
R=30
A=30
A=30
60 TAPER
W & J DEVRIES
MORNINGSTAR BROTHERS
(PARCEL 'A')
MORNINGSTAR BROTH
(PARCEL 'A')
70 TAPER
63


27 HIGHWAY 20
00 ℄ NEW ENTRANCE
STORE
70 DECEL
160 TAPER
D & A CHOU
600
700
800
900
R=900
295 ACCEL
80 TAPER
ESTIMATED BOUNDARY OF PROPOSED OWMC FACILITIES
EXISTING PROPERTY
REQUIRED PROPERTY
LIGHT STANDARDS
SCALE
25m
0
50m
1:20,000
N

O. W. M. C.

WEST ENTRANCE

FIGURE D-7

DILLON

DRWG No 9924-13-SK7

CORRESPONDENCE CONCERNING

SITE AREA ACCESS REQUIREMENTS

1.	MTC to Dillon	25 August 1986
2.	Dillon to MTC	22 September 1986
3.	MTC to Dillon	12 November 1986
4.	MTC to Dillon	1 December 1986
5.	Notes of Meeting with Property Owners	12 February 1987
6.	Dillon to West Lincoln	14 May 1987
7.	Dillon to MTC	30 June 1987
8.	MTC to Dillon	27 July 1987

Ontario

Ministry of
Transportation and
Communications

Planning and Design
Central Region
5000 Yonge Street
Willowdale, Ontario.
M2N 6E9

Telephone: 224-7567

[illegible]
P Hunt
10 Sept

file no
please?
9924-33

August 25, 1986

Mr. J.R. Crosby, P. Eng.
Project Manager
M.M. Dillon Limited
Box 1850, Station 'A'
Willowdale, Ontario.
M2N 6H5

RECEIVED
SEP 2 1986
M. M. DILLON LTD.
TORONTO OFFICE

Attention: R.A. Loukes, P. Eng.

Dear Mr. Crosby:

Re: OWMC Phase 4B
Proposed site access to Hwy. 20

As per your request we have reviewed your preliminary proposals for the OWMC entrances on Highway 20.

A. Emergency Entrance to Highway 20

We agree with the proposed emergency access (MTC, CS - 22) to Highway 20. The entrance is to be controlled via a locked gate as per your proposal. Illumination is not warranted at this access.

B. Highway 20/Schram Road/Silverdale Road Intersection.

We agree that the jog between Schram Road and Silverdale Road should be removed as per your proposal. We have no preference from an engineering standpoint, in which road is re-aligned.

We are also in agreement with your proposal to reconstruct 1) a left turn storage lane on Highway 20 (east to south) 2) a right turn taper on Highway 20 (west to south) and 3) a channelized right turn lane on Schram Road (south to east). Warrants for the abcve item would be satisfied during the reconstruction stage.

...../2

These intersection improvements would also add a degree of safety to the operation of the intersection, although the warrants for these lanes are not met during the projected plant capacity in 1995.

The right turn channelization from Schram Road (south to east) must have an acceleration lane and taper long enough to ensure a safe merge for the trucks using this facility. The actual length of the taper is dependent on the radius of the channelized right turn lane.
This right turn channelization is also a warrant to reconsider partial illumination. Based on the materials being handled partial illumination is warranted.

Signalization is not warranted at this intersection.

The existing right-of-way on this section of Highway 20 varies considerably. A 30m right-of-way is considered acceptable. This should accommodate the proposed intersection improvements.

Sincerely yours,

P.Verok

P.G. Verok, P. Eng.
Project Manager

PGV/gf

DILLON
Consulting Engineers & Planners

OUR FILE: 9924-33
YOUR FILE:

22 September 1986

Mr. Peter Billings, P.Eng.
Manager of Engineering and
Right-of-Way
Ministry of Transportation
and Communications
Central Region
Planning and Design Section
5000 Yonge Street
Willowdale, Ontario
M2N 6E9

Attention: Mr. P.G. Verok, P.Eng.
Project Manager

OWMC Phase 4B: Site Access Design at Highway 20

Dear Sirs:

We append two prints each of our drawings SK4 and SK5 which are the two options under consideration for the realignment of the Highway 20/Schram Road/Siverdale Road intersections in the Township of West Lincoln. After evaluation of each option in relation to property and other impacts associated with each of these, it is anticipated that a preferred option will be selected for inclusion in the OWMC environmental assessment report.

The two preliminary design plans have been developed based on the results of our meeting of 28 July 1986 and subsequent telephone discussion concerning Ministry design requirements. Consequently, we will appreciate your review of both options and the receipt of your comments concerning the adherance to geometric design and operational requirements of the Ministry. Your comments will be included as a part of the evaluation of options by the OWMC.

As we noted in our earlier meeting, Schram Road has been selected as the primary site entrance to the OWMC waste treatment site LF-9C.

It is our intention to submit prints of SK4 and SK5 to the appropriate officials in the Township of West Lincoln to solicit their comments on the two realignment options under consideration. So that you will be fully appraised of this communi-

....continued

RECEIVED
NOV 18 1986
M. M. DILLON LTD.
TORONTO OFFICE

Ontario
Ministry of
Transportation and
Communications

Telephone No. 224-7567

Planning and Design Section
Central Region
5000 Yonge Street
Willowdale, Ontario
M2N 6E9

November 12, 1986

M. M. DILLON LTD.
DATE REC'D:
FILE NO. 4924-13
LE

Mr. J.R. Crosby, P. Eng.
Project Manager
M.M. Dillon Ltd.
Box 1850, Station 'A'
Willowdale, Ontario
M2N 6H5

Dear Sir;

RE: OWMC Phase 4B
Proposed Site Access to Highway 20.

We have reviewed your two proposed options for the realignment of the Highway 20/Schram Road/Silverdale Road intersection in the Township of West Lincoln.

The lengths of the tapers and deceleration and left turn storage lanes are satisfactory. The opposing left turn lanes were created by widening solely on the north side of Hwy 20. This is a dangerous situation since, in times of poor visibility or snow conditions, a west bound through vehicle could be travelling in the west bound left turn lane. To lessen the chance of a head-on situation, the left turn lane should straddle the old centre line so that both EB and WB vehicles have to move half a lane to get into the left turn lane. This reduces the possibility of an accidental head-on collision, since a vehicle remaining in the old through lane would only encroach into ½ the opposing left turn lane.

The 70m taper on the right turn channelization on Schram Road is satisfactory. The 295 m acceleration and 80 m taper is sufficient to allow trucks to accelerate and merge with Highway 20 traffic.

The partial illumination, as indicated, is acceptable.

The proposed emergency entrance to the site is acceptable.

All of the modifications required on Hwy 20 will be the responsibility of the developer. I am enclosing a copy of our standard fact sheet, which should be completed and returned to this office, so that we may draft a legal agreement to cover the proposed work. We will also require a detailed cost estimate and

Cont'd/2...

a reproducable legal sized copy of the plan to use as a schedule in the legal agreement. The legal agreement is required prior to any construction taking place.

To assist you in preparing your cost estimate, I have requested our Geotechnical Section to investigate the pavement and granular depth requirements for Hwy 20. These will be forwarded to you as soon as the pavement design is prepared.

If you have any questions, regarding the above, please contact me.

P. Verok

P.G. Verok
Project Manager

enclose.

PGV/lm

c.c. P. Billings
M. Delsey

TO BE COMPLETED BY DEVELOPER

Fact and Cost Sheet (attached): Central Region, 5000 Yonge Street,
Willowdale, Ontario, M2N 6E9.

Planning and Design; Contact ____________ Phone No. ____________

District Contact ____________ Phone No. ____________

Second Party Contact ____________ Phone No. ____________

Agreement Forwarded to (*)

Subdivision No.: ____________ Date ____________

Lot: ________ Concession: ____________ Municipality ____________

M.T.C. - W.O. / ____________

Development Name: ____________

Legal-Company (Exact Name and Address): ____________

____

____

____________ Phone No. ____________

Company's Signing (Authority and Title): ____________

____

____

Invoicing - Name and Address: ____________

____

Consultant Name and Address: ____________

____

____________ Phone No. ____________

Anticipated Date of Construction ____________

Anticipated Number of Working Days to Complete Work ____________

Signature of Company Agent:

Ontario

Telephone No.: 224-7567

Ministry of
Transportation and
Communications

Planning and Design Section
Central Region
5000 Yonge Street
Willowdale, Ontario
M2N 6E9

RECEIVED
DEC 5 1986
M. M. DILLON LTD.
TORONTO OFFICE

M. M. DILLON LTD.
~~RAL~~
~~JRC~~
FILE 9924-33

Mr. J.R. Crosby, P. Eng.
Project Manager
M.M. Dillon Ltd.
Box 1850, Station A
Willowdale, Ontario
M2N 6H5

December 1, 1986

Dear Sir,

Re: OWMC Phase 4B
Proposed Site Access to Highway 20.

As mentioned in my previous letter of 86-11-12, I have requested recommendations from the Geotechnical Section. The attached memo details the pavement requirements for the intersection improvements at Highway 20 and Schram Road.

This should assist you in preparing your cost estimate for the proposed improvements.

Sincerely yours,

P. Verok

P.G. Verok, P. Eng.
Project Manager

attach.
PGV/lrm

memorandum

Ontario

File 9924-33

To: E. Ellard
Area Manager
Planning & Design
Central Region

Date: 86 11 21

Attention: P. Verok

Re: O.W.M.C. Facility on Highway 20
District 4, Burlington

This is in reply to your request on 86-11-04 for pavement recommendations for the widening of Highway 20 at Schram Road.

This section of Highway 20 was reconstructed in 1982 under Contract 82-83 and is in good condition with a Pavement Condition Rating (PCR) of 86.

We recommend that the proposed Highway 20 widening at Schram Rd. be constructed to match the design used on Contract 82-83. Widening from the edge of pavement to the shoulder rounding should be constructed by excavating the existing shoulder to provide for:

40 mm HL 3 on

40 mm HL 8 on

40 mm HL 8

120 mm Total

Beyond the shoulder rounding the existing materials should be excavated to provide for:

375 mm Granular 'A', Type II (minimum) on

200 mm HL 8 Coarse Aggregate

under the 120 mm of hot mix detailed above. The depth of granular 'A' may have to be increased to match the existing bottom of granulars.

The two upper lifts of hot mix should be keyed into the existing Highway 20 asphalt by providing a key 80 mm deep by 300 mm wide.

This Highway 20 design should be carried through to the end of the corner radii for sideroads and up to the ramp bullnose.

The right hand turn ramp provided at Schram Road should be designed for:

40 mm HL 3 on

40 mm HL 8 on

40 mm HL 8

120 mm Total on

375 mm Granular 'A', Type II

If you have any questions please contact the undersigned.

HS/RDG:lf

H. Sturm

for: R. D. Gunter
Head, Geotechnical Section

OWMC

Ontario
Waste Management
Corporation

2 Bloor Street West
11th Floor
Toronto, Canada
M4W 3E2
(416) 923-2918

RECEIVED
FEB 13 1987

Memorandum

To J. Micak

From Paul Hunt

Subject MEETING WITH PROPERTY OWNERS
Re: Schram/Silverdale Road Realignment
File SEC:P1 and MMD-T:F3

JRC

February 12, 1987

9924-13

Jim, the subject meeting was held February 10, 1987, at our regional office in Smithville. Representing the Corporation were: L. Daniels, M.L. Garr, John Crosby (MMD-T) and myself. The following site/area residence were in attendance:

- Ken and Gloria Beamer;
- Stan and Helen Kszan;
- Clarence Beamer;
- Bill and Tessie Zdichavsky;
- Joe Zdichavsky;
- Hans Diek;
- Bert Snippe.

M.L. Garr opened the meeting by introducing J. Crosby, and me, and indicated the general intent of the meeting. J. Crosby, using a large illustration of the plant layout, discussed the four entrance/exit requirements (employees, truck deliveries, and two landfill access driveways). In addition, an emergency access/exit to and from Hwy. 20 was noted. The western access option was explained, but a general preference for the eastern access (Schram Road) by OWMC, was indicated by J. Crosby, who also referred to a report in preparation, which is evaluating the facility access options.

Schram Road was then the focus of several questions/comments:

- HK: Schram Road should be widened to four lanes and paved.

- SK: Will Schram Road be closed? (Response, J. Crosby - no).

A Crown Agency

Paper made with recycled fibre

- BS: Could Schram Road be widened to three lanes and paved? (Response, J. Crosby - any widening of Schram Road would probably occur by taking land from the OWMC or western side of the road).

J. Crosby, using the two road realignment drawings (SK 4 and SK 5), then explained the two realignment options, that of realigning Silverdale Road with Schram Road and realigning Schram Road with Silverdale Road. It was pointed out that both options would unfortunately involve the taking of a significant amount of land from the Zdichavsky property, at the corner of Schram Road and Hwy. 20. This would result in making the commercial enterprize there (truck and engine repair and variety store), economically unviable. In addition, B. and T. Zdichavsky's house is in a location that will be required for the intersection upgrading.

The following questions/comments were made:

- BZ: Stated that he has six people working for him currently in his repair shop, and he has plans to expand his business.

- JZ: Voiced concerns about scheduling the trucks hauling wastes to the facility. He believes that there will be numerous excursions of the daily eight hours that the facility will be "open" to receive (accept and unload wastes) incoming trucks, because of bad weather conditions, truck breakdowns, long hauls, etc.

  Concern was expressed regarding the potential lack of compliance by the truck drivers with respect to following the designated route to the facility. (Response, J. Crosby - monitoring will identify those trucks that don't follow the designated route. Corrective action will then be taken to ensure compliance with the desired routing.)

J. Crosby then proceeded to discuss the road/widening requirements at the subject intersection. It was explained that this road upgrading would be necessary to accommodate turning and merging lanes to and from Schram Road/facility access, and would involve the taking of "slivers" of land ranging from one to six metres in width, from the front of properties bordering Hwy. 20 to the east of Schram and Silverdale Roads. J. Crosby noted that if burried drainage systems were used instead of open ditches, land requirements would be reduced or even eliminated.

The remaining discussions were of an informal and open nature. The major suggestion put forth however, was made by Clarence Beamer, who stated that site access be made from the western boundary. This position was supported by several other property owners in attendance.

c.c.: M.L. Garr
L. Daniels
M. Scott
B. Mitchell
B. Sakauye
D. Chollak
J. Crosby (MMD-T)

DILLON
Consulting Engineers & Planners

OUR FILE:
YOUR FILE:

May 14, 1987

Township of West Lincoln
Box 400
318 Canboro Street
Smithville, Ontario
L0R 2A0

Attention: Mr. David R. McCallum
Environmental Project
Co-ordinator

OWMC Phase 4B: Schram Road
Access to Site LF-9C

Dear Sir:

It has been our intent since September 1986 to appraise you of the site LF-9C access requirements and to secure your inputs to the evaluation process. Unfortunately, the initial meeting date of 19 November 1986 was cancelled, as was the rescheduled date of 18 February 1987.

As a part of the OWMC environmental assessment of preferred site LF-9C, it is desirable to secure municipal inputs and ultimately approvals for the location and preliminary design features of the access requirements between the site and the public road system. Based on the OWMC evaluation of access road options to this site, it has been determined that the impacts on the surrounding road system are minimized with provision of primary site access from Schram Road. The use of Schram Road for this service necessitates a realignment of the Highway 20/Schram Road/Silverdale Road intersection to eliminate the adverse existing 57 m jog between Schram and Silverdale Roads along Highway 20.

This submission has been prepared to secure Township reaction and guidance to the access evaluation now underway. A similar transmittal has been made to the Ministry of Transportation and Communications having regard to required improvements to Highway 20 at the Schram Road/Silverdale Road intersection and an emergency access to the northern part of the site from Highway 20.

...continued

M. M. DILLON LIMITED – 47 SHEPPARD AVENUE EAST, TORONTO, ONTARIO • (416) 229-4646
MAIL: BOX 1850, STATION A, WILLOWDALE, ONTARIO, CANADA M2N 6H5 • TELEX 064-7540

More specifically, this transmittal addresses the following areas which fall within the public roads jurisdiction of the Township of West Lincoln:

- Proposed improvement of Schram Road between Highway 20 and Vaughan Road;
- Two realignment options for the Highway 20/Schram Road/ Silverdale Road intersection;
- Location of entrances to Site LF-9C from Schram Road; and
- Geometric design features proposed for the site entrances from Schram Road.

Each of the four subject areas is addressed in the attached report.

Yours truly,

M.M. DILLON LIMITED

JRC/kd

John R. Crosby, P.Eng.
Project Manager -
Transportation

c.c. Paul Hunt, OWMC
P.G. Verok, Central Reg. MTC.

ACCESS CONSIDERATIONS TO SITE LF-9C

BACKGROUND AND PURPOSE

During Phase 4A analysis it became apparent that insufficient site frontage existed on Highway 20 to accommodate the number of site entrances required for the operation of the waste treatment facility.

A special investigation was therefore undertaken to consider all options available. Based upon the preliminary results of these investigations, it was generally concluded that primary ingress/egress from the Schram Road frontage was preferred.

This then formed the basis for the preliminary planning and design of access requirements for the waste treatment site. These considerations are discussed in the balance of this report.

As site access impinges on roadways within the jurisdiction of the Township of West Lincoln (Schram and Silverdale Roads) and the Ministry of Transportation and Communications (King's Highway 20), it is desirable to secure planning inputs from both agencies as a basis for future decisions. Ultimately, decisions and approvals will be required for the design and construction of site access.

STUDY AREA CONSIDERATIONS

1. LOCATION OF SITE ENTRANCES

We have appended Figure D-3 showing the proposed location of site entrances to Schram Road. The location of the primary truck entrance to the plant operating area and the employee/

visitor entrance to the administration building are reasonably firm but may be subject to some adjustment at the time of more detailed engineering design.

The location of the remaining two entrances between Schram Road and the outer ring road serving the landfill area, are approximate only and are subject to more detailed investigations of site design. It is anticipated that only one of these entrances would be used at any given point in time depending upon the location of the landfill operating area. The most convenient entrance would be used to minimize internal site travel.

The site access from Vaughan Road (this is now in-place) would be used exclusively for servicing the Meteorological/ Air Monitoring Station and is not intended to serve any other site movements. Similarily, the access road to the north and connecting to Highway 20 would be used exclusively as an emergency services entrance (fire, police or ambulance service), in the event that the Schram Road entrances should be temporarily blocked due to an unforseen event.

Your comments on the suitability of the entrance locations to the site from Schram Road are solicated.

2. IMPROVEMENT OF SCHRAM ROAD

The existing Schram Road, based on the Municipal Road Appraisal Sheet prepared by the Township's consultant for section number 00133 (Highway 20 to Vaughan Road), is a 1.4 km gravel surfaced rural roadway within a 20 m right-of-way and a design class of 50 to 200 vehicles per day. With the estimated growth in background traffic use and the surcharge resulting from OWMC operation, the estimated 1995 AADT is

515 vehicles per day which includes 86 medium and heavy trucks. In the event that the site is expanded to process 300,000 t/a of special waste, the estimated year 2000 AADT is 735 vehicles per day including 206 medium and heavy trucks.

Based on the forecasted future use of Schram Road and the medium and heavy truck loadings anticipated, it is evident that a major structural upgrading of the surface width and type along the entire road section will be required. Consequently, we solicit your comments as to the appropriate design requirements for upgrading Schram Road to serve the future traffic demands.

3. DESIGN FEATURES OF SCHRAM ROAD ENTRANCES

We have made a preliminary selection of a design option for all entrances between Schram Road and Site LF-9C. We feel that the MTC truck access standard CS-19 with a 50 m paved entrance taper is suitable for all entrances. A paved all-weather road surface would be included beyond the entrances within the site. Appropriately sized culverts across the road drainage ditch at the entrance would also be provided (See Figure D-5 appended).

Your comments are solicated on the suitability of the entrance designs proposed to serve the site.

4. REALIGNMENT OF SCHRAM ROAD/SILVERDALE ROAD/HIGHWAY 20 INTERSECTIONS

Two options were considered and eliminated due to the considerable impacts that would result:

o closure of Silverdale Road at Highway 20, and

- a major realignment of Silverdale Road to either the east or west with the new intersection a minimum of 250 m removed from the Schram Road intersection

There remained two options deemed suitable for evaluation. These are displayed in Figures D1 and D2 attached.

Copies of both plans and the overall access plan were submitted to MTC for review and comment. The initial response from MTC is as set out in a copy of their letter of 25 August 1986. A more detailed response of the design elements required by the Ministry is covered in their letter of 12 November 1986 (see copy attached).

With specific reference to the MTC 12 November 1986 letter, we are prepared to modify the design plan in accordance with paragraph two of the letter. The results of this modification would be to relocate the north edge of pavement about 2 m southward; in a similar fashion, the proposed south edge of pavement would be located about 2 m further to the south. This proposed change would reduce the potential property acquisition need along the north R-O-W limit, but increase the potential acquisition need to the south.

Your comments are requested as an input to our evaluation of the two options.

Enclosures (6)

16 February 1987

DILLON
Consulting Engineers • Planners
Environmental Scientists

OUR FILE 9924-13
YOUR FILE

30 June 1987

Mr. Peter Billings, P.Eng.
Manager of Engineering and
Right-of-Way
Ministry of Transportation
and Communications
Central Region, Planning & Design
5000 Yonge Street
Willowdale, Ontario
M2N 6E9

Attention: Mr. P.G. Verok, P.Eng.
Project Manager

OWMC Phase 4B: Revised Site Access Design at Highway 20

Dear Sirs:

We gratefully acknowledge the receipt of your correspondence of 12 November 1986 regarding your review of our design for the two options for the realignment of the Highway 20/Schram Road/Silverdale Road intersections in the Township of West Lincoln. We also received your early December 1986 correspondence regarding recommendations for the base and pavement parameters to apply in our construction cost estimate.

Since our original correspondence of 22 September 1986, the two original options for realignment have been evaluated by OWMC with a preferred alternative being selected, and another option on the western boundary of the site has been introduced. We append two prints each of our drawing SK6 and SK7 which are the two options now under consideration for access to Highway 20. A further evaluation of these two options will be undertaken and a preferred option will be selected for inclusion in the OWMC environmental assessment report.

/2....

These two preliminary design plans have been developed based on our original designs and modified as per the comments received from MTC in the 12 November 1986 correspondence. The SK6 drawing is a modification to our original SK5 drawing. The SK7 drawing has similar features; however, it is a tee intersection located approximately 1 kilometer west of the Schram Road intersection which would provide access to the west side of the OWMC site as opposed to access from the Schram Road side.

We will appreciate your review of both options and the receipt of your comments concerning adherence to geometric design and operational requirements of the Ministry. Your comments will be included as part of the evaluation of options by the OWMC.

Also enclosed is a copy of our transmittal to the Township of West Lincoln requesting their comments on the two Schram Road realignment options, and access to Schram Road. This is provided for information purpose only.

Should you require any further information concerning this request prior to preparation of your response, please advise.

Yours truly,

M.M. DILLON LIMITED

John R. Crosby, P.Eng.
Project Manager -
Transportation

RAL:dcs
Encls:

cc: Paul Hunt, OWMC
D. Damman, OWMC

Ontario

Telephone No: 224-7567

Ministry of
Transportation and
Communications

Planning & Design Section,
Central Region,
5000 Yonge Street,
Willowdale, Ontario.
M2N 6E9

July 27, 1987

Mr. J. R. Crosby, P. Eng.
Project Manager
M. M. Dillon Limited
Box 1850 Station A
Willowdale, Ontario
M2N 6H5

Dear Sir:

Re: OWMC Phase 4B
Revised Site Access Design at Highway 20

We have reviewed your latest proposal (SK-7) for access to the proposed O.W.M.C. facility on Highway 20.

The geometric design of this intersection is satisfactory. The illumination would have to conform to our current standards as outlined in directive B-6 (attached).

The realignment of Schram Road (SK-6) is preferable to the west entrance (SK-7) since it would utilize an existing access to Highway 20.

If you have any questions regarding the above please contact me.

Yours truly,

P. Verok

P. G. Verok, P. Eng.
Project Manager

PGV/pc

Attach.

cc: P. Billings
M. Delsey

Attachment No. 4

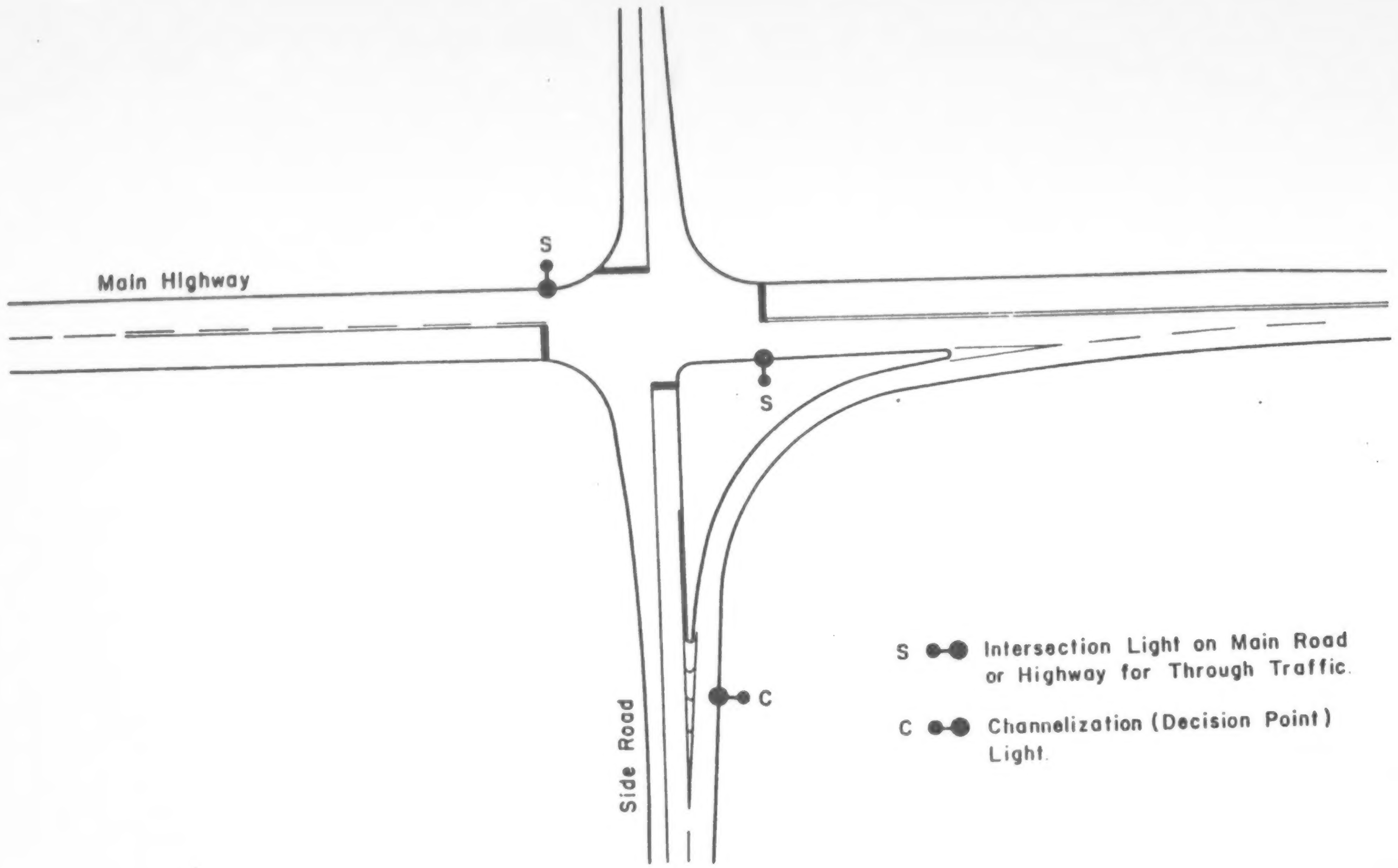

S
Main Highway
S
C
Side Road
S ●–● Intersection Light on Main Road or Highway for Through Traffic.
C ●–● Channelization (Decision Point) Light.

Figure 4. Four Way Intersection with Channelizing Island, 2 Lanes intersecting 2 or 4 Lanes.

APPENDIX E

TRANSPORTATION DATA SUPPLIED TO OTHER CONSULTANTS FOR SITE ASSESSMENT PHASE 4B

- Transportation Costs for Materials Along Total System for:
  - 150 000 t/a typical operation
  - 150 000 t/a high solidified waste case
  - 300 000 t/a typical operation
  - 300 000 t/a high solidified waste case

TABLE E.1

OWMC PHASE 4B - TRANSPORTATION COST CALCULATIONS (SPECIAL WASTE ONLY)

REVISED SCENARIO 2 | 300,000 t/a | INTEGRATED SITE OPTION: LF-9C

MODEL ZONE #	CENTROID LOCATION	TIME TO ZONE 54	DISTANCE TO ZONE 54	TERMINAL TIMES (MIN)	TIME COST ($/MIN)	DISTANCE COST ($/KM)	TRUCK MOVEMENTS ORGANIC PUMP	TRUCK MOVEMENTS ORGANIC NON-PUMP	TRUCK MOVEMENTS INORGANIC PUMP	TRUCK MOVEMENTS INORGANIC NON-PUMP	TRUCK MOVEMENT COSTS ($) ORGANIC PUMP.	TRUCK MOVEMENT COSTS ($) ORGANIC NON-PUMP.	TRUCK MOVEMENT COSTS ($) INORGANIC PUMP.	TRUCK MOVEMENT COSTS ($) INORGANIC NON-PUMP.
1	WINDSOR	0	787	80	1.42	1.45	0	0	0	0	0	0	0	0
2	BRANTFORD	0	297				3	7	4	0	1292	3015	1723	0
3	ST CATHARINES-NIAGARA	55	0				792	177	3883	1600	151826	33931	744371	306720
4	ORILLIA	0	495				2	2	2	0	1436	1436	1436	0
5	MIDLAND	0	519				2	2	2	0	1505	1505	1505	0
6	TRENTON	0	603				2	2	2	0	1749	1749	1749	0
7	TIMMINS	0	1,621				0	0	3	0	0	0	7051	0
8	HAMILTON	115	0				216	259	7197	1500	59810	71717	1992849	415350
9	CHATHAM	0	599				0	0	0	0	0	0	0	0
10	OTHER S.W.-CLINTON	0	481				0	0	0	0	0	0	0	0
11	SARNIA	0	605				0	0	0	0	0	0	0	0
12	OTHER S.C.-HALIBURTON	0	687				3	3	5	0	2988	2988	4981	0
13	OTHER S.E.-RENFREW	0	1,041				2	0	7	0	3019	0	10566	0
14	OTHER NC.&E-TROUT CREEK	0	853				3	0	4	0	3711	0	4947	0
15	OTHER N.W.-GERALDTON	0	2,607				0	0	2	0	0	0	7560	0
16	THUNDER BAY	0	3,061				0	0	2	0	0	0	8877	0
17	BARRIE	0	427				2	4	2	0	1238	2477	1238	0
18	LONDON	0	415				0	0	0	0	0	0	0	0
19	KITCHENER/WATERLOO	0	289				85	194	7	0	35619	81296	2933	0
20	TORONTO	0	283				692	943	854	94	283962	386960	350439	38573
21	OSHAWA	0	387				3	16	4	0	1683	8978	2245	0
22	GUELPH	0	249				98	123	614	73	35383	44409	221685	26357
23	SAULT STE. MARIE	0	1,639				0	0	2	0	0	0	4753	0
24	STRATFORD	0	367				0	0	0	0	0	0	0	0
25	SUDBURY	0	1,037				2	0	3	0	3007	0	4511	0
26	PETERBOROUGH	0	533				3	9	4	0	2319	6956	3091	0
27	NORTH BAY	0	941				2	0	2	0	2729	0	2729	0
28	BELLEVILLE	0	643				2	4	2	0	1865	3729	1865	0
29	KINGSTON	0	789				2	0	2	0	2288	0	2288	0
30	BROCKVILLE	0	955				2	0	2	0	2770	0	2770	0
31	OWEN SOUND	0	531				2	2	2	0	1540	1540	1540	0
32	OTTAWA	0	1,193				0	0	3	0	0	0	5190	0
33	CORNWALL	0	1,149				0	0	2	0	0	0	3332	0

TOTAL TRANSPORT COST FOR THIS OPTION	$4,367,538
TOTAL NUMBER OF TRUCKS FOR THIS OPTION	19,552

TABLE E.2

OWMC PHASE 4B - TRANSPORT COST CALCULATIONS - (ADDITIVES & REAGENTS)

150,000 t/a SPECIAL WASTE — INTEGRATED SITE OPTION: LF-9C — TYPICAL OPERATION

		SHIPMENT (3)						
ADDITIVES & REAGENTS	LOCATION	QUANTITY (t/a)	LOAD SIZE (tonnes)	# OF TRUCKS	DISTANCE (2*d) (km)	TOTAL TIME (min)(1,2)	COST BASIS(4)	COST ($)
CEMENT	MISSISSAUGA	13,320	39	342	282	0	$110+$1.58/km	$190,002
SODIUM SILICATE	ETOBICOKE	1,300	20	65	282	0	$110+$1.58/km	$36,111
CAUSTIC SODA	CORNWALL	7,680	20	384	1148	0	$110+$1.58/km	$738,755
LIME	TORONTO	1,980	24	83	282	0	$110+$1.58/km	$46,111
CARBON	HAMILTON	275	20	14	126	0	$52+$1.47/km	$3,321
NITROGEN	SCARBOROUGH	100	4	25	282	0	$90+$1.31/km	$11,486
CLAY	TORONTO	320	12	27	282	0	$90+$1.31/km	$12,404
FLY/ASH	NATICOKE	320	10	32	140	0	$104+$1.47/km	$9,914
SULPHURIC ACID	TORONTO	731	20	37	282	0	$110+$1.58/km	$20,556
SODIUM BISULPHITE	TORONTO	1,000	20	50	282	0	$110+$1.58/km	$27,778
SODIUM HYPOCHLORITE	TORONTO	1,000	20	50	282	0	$110+$1.58/km	$27,778
FILTER AID	TORONTO	51	5	10	282	0	$90+$1.31/km	$4,594
SALT	ST. CATHARINES	77	5	15	50	0	$45+$1.31/km	$1,658
TOTALS				1,134				$1,130,467
OTHER MATERIALS								
GRANULAR MAT'L TO LANDFILL	VINELAND	7,100	30	237	36	0	$55+$1.58/km	$26,516
EARTH REMOVAL FROM LANDFILL	VINELAND	170,300	21.7	7,848	36	0	$55+$1.58/km	$878,034
TOTALS				8,085				$904,550
							TOTAL COST	$2,035,017

NOTES:

(1) The salt transport includes a 30 minute terminal time at the LF-9C site.

(2) The granular and earth removal transport includes a total of 60 minutes of terminal time.

(3) Basd upon the typical operation treatment process defined by Monenco limited, 22 Sept 1986; and export clay quantities M.M.Dillon Ltd., 28 May 1987.

(4) Based on updated costs by Pilorusso Research, 11 Sept 1987.

TABLE E.3

OWMC PHASE 4B - TRANSPORT COST CALCULATIONS - (ADDITIVES & REAGENTS)

150,000 t/a SPECIAL WASTE | INTEGRATED SITE OPTION: LF-9C | HIGH SOLIDIFIED WASTE CASE

ADDITIVES & REAGENTS	LOCATION	SHIPMENT (3) QUANTITY (t/a)	LOAD SIZE (tonnes)	# OF TRUCKS	DISTANCE (2*d) (km)	TOTAL TIME (min)(1,2)	COST BASIS(4)	COST ($)
CEMENT	MISSISSAUGA	25,970	39	666	282	0	$110+$1.58/km	$370,003
SODIUM SILICATE	ETOBICOKE	5,250	20	263	282	0	$110+$1.58/km	$146,112
CAUSTIC SODA	CORNWALL	7,580	20	379	1148	0	$110+$1.58/km	$729,135
LIME	TORONTO	1,980	24	83	282	0	$110+$1.58/km	$46,111
CARBON	HAMILTON	275	20	14	126	0	$52+$1.47/km	$3,321
NITROGEN	SCARBOROUGH	100	4	25	282	0	$90+$1.31/km	$11,486
CLAY	TORONTO	320	12	27	282	0	$90+$1.31/km	$12,404
FLY/ASH	NATICOKE	320	10	32	140	0	$104+$1.47/km	$9,914
SULPHURIC ACID	TORONTO	731	20	37	282	0	$110+$1.58/km	$20,556
SODIUM BISULPHITE	TORONTO	950	20	48	282	0	$110+$1.58/km	$26,667
SODIUM HYPOCHLORITE	TORONTO	950	20	48	282	0	$110+$1.58/km	$26,667
FILTER AID	TORONTO	51	5	10	282	0	$90+$1.31/km	$4,594
SALT	ST. CATHARINES	77	5	15	50	0	$45+$1.31/km	$1,658
TOTALS				1,647				$1,408,628
OTHER MATERIALS								
GRANULAR MAT'L TO LANDFILL	VINELAND	11,700	30	390	36	0	$55+$1.58/km	$43,633
EARTH REMOVAL FROM LANDFILL	VINELAND	282,400	21.7	13,014	36	0	$55+$1.58/km	$1,456,006
TOTALS				13,404				$1,499,640
							TOTAL COST	$2,908,267

NOTES:

(1) The salt transport includes a 30 minute terminal time at the LF-9C site.

(2) The granular and earth removal transport includes a total of 60 minutes of terminal time.

(3) Based upon the typical operation treatment process defined by Monenco Limited, 22 Sept 1986; and export clay quantities M.M. Dillon Ltd., 28 May 1987.

(4) Based on cost update by Pilorusso Research, 11 Sept 1987

TABLE E.4

ONWC PHASE 4B - TRANSPORT COST CALCULATIONS - (ADDITIVES & REAGENTS)

300,000 t/a SPECIAL WASTE		INTEGRATED SITE OPTION: LF-9C					TYPICAL OPERATION	
		SHIPMENT (3)			DISTANCE	TOTAL		
		QUANTITY	LOAD SIZE	# OF	(2*d)	TIME	COST	COST
ADDITIVES & REAGENTS	LOCATION	(t/a)	(tonnes)	TRUCKS	(km)	(min)(1,2)	BASIS(4)	($)
CEMENT	MISSISSAUGA	26,640	39	684	282	0	$110+$1.58/km	$380,003
SODIUM SILICATE	ETOBICOKE	2,600	20	130	282	0	$110+$1.58/km	$72,223
CAUSTIC SODA	CORNWALL	15,360	20	768	1148	0	$110+$1.58/km	$1,477,509
LIME	TORONTO	3,960	24	165	282	0	$110+$1.58/km	$91,667
CARBON	HAMILTON	550	20	28	126	0	$52+$1.47/km	$6,642
NITROGEN	SCARBOROUGH	200	8	25	282	0	$90+$1.31/km	$11,486
CLAY	TORONTO	640	12	54	282	0	$90+$1.31/km	$24,809
FLY/ASH	NATICOKE	640	10	64	140	0	$104+$1.47/km	$19,827
SULPHURIC ACID	TORONTO	1,462	20	74	282	0	$110+$1.58/km	$41,111
SODIUM BISULPHITE	TORONTO	2,000	20	100	282	0	$110+$1.58/km	$55,556
SODIUM HYPOCHLORITE	TORONTO	2,000	20	100	282	0	$110+$1.58/km	$55,556
FILTER AID	TORONTO	102	5	20	282	0	$90+$1.31/km	$9,188
SALT	ST. CATHARINES	154	5	31	50	0	$45+$1.31/km	$3,426
TOTALS				2,243				$2,249,003
OTHER MATERIALS								
GRANULAR MAT'L TO LANDFILL	VINELAND	13,900	30	463	36	0	$55+$1.58/km	$51,800
EARTH REMOVAL FROM LANDFILL	VINELAND	336,500	21.7	15,507	36	0	$55+$1.58/km	$1,734,923
TOTALS				15,970				$1,786,724
							TOTAL COST	$4,035,727

NOTES:

(1) The salt transport includes a 30 minute terminal time at the LF-9C site.

(2) The granular and earth removal transport includes a total of 60 minutes of terminal time.

(3) Based upon the typical operation process defined by Monenco Limited, 22 Sept 1986; and export clay quantities M.M.Dillon Ltd., 28 May 1987.

(4) Based on cost update by Pilorusso Research, 11 Sept 1987

TABLE E.5

OWMC PHASE 4B - TRANSPORT COST CALCULATIONS - (ADDITIVES & REAGENTS)

300,000 t/a SPECIAL WASTE — INTEGRATED SITE OPTION: LF-9C — HIGH SOLIDIFIED WASTE CASE

ADDITIVES & REAGENTS	LOCATION	SHIPMENT (3) QUANTITY (t/a)	LOAD SIZE (tonnes)	# OF TRUCKS	DISTANCE (2*d) (km)	TOTAL TIME (min)(1,2)	COST BASIS(4)	COST ($)
CEMENT	MISSISSAUGA	51,740	39	1,328	282	0	$110+$1.58/km	$737,784
SODIUM SILICATE	ETOBICOKE	10,500	20	525	282	0	$110+$1.58/km	$291,069
CAUSTIC SODA	CORNWALL	15,360	20	768	1148	0	$110+$1.58/km	$1,477,509
LIME	TORONTO	3,960	24	165	282	0	$110+$1.58/km	$91,667
CARBON	HAMILTON	550	20	28	126	0	$52+$1.47/km	$6,642
NITROGEN	SCARBOROUGH	200	8	25	282	0	$90+$1.31/km	$11,486
CLAY	TORONTO	640	12	54	282	0	$90+$1.31/km	$24,809
FLY/ASH	NATICOKE	640	10	64	140	0	$104+$1.47/km	$19,827
SULPHURIC ACID	TORONTO	1,462	20	74	282	0	$110+$1.58/km	$41,111
SODIUM BISULPHITE	TORONTO	1,900	20	95	282	0	$110+$1.58/km	$52,778
SODIUM HYPOCHLORITE	TORONTO	1,900	20	95	282	0	$110+$1.58/km	$52,778
FILTER AID	TORONTO	102	5	20	282	0	$90+$1.31/km	$9,188
SALT	ST. CATHARINES	154	5	31	50	0	$45+$1.31/km	$3,426
TOTALS				3,272				$2,820,674
OTHER MATERIALS								
GRANULAR MAT'L TO LANDFILL	VINELAND	23,000	30	767	36	0	$55+$1.58/km	$85,812
EARTH REMOVAL FROM LANDFILL	VINELAND	565,000	21.7	26,037	36	0	$55+$1.58/km	$2,913,020
TOTALS				26,804				$2,998,832
							TOTAL COST	$5,819,506

NOTES:

(1) The salt transport includes a 30 minute terminal time at the LF-9C site.

(2) The granular and earth removal transport includes a total of 60 minutes of terminal time.

(3) Based upon the high solidified waste process defined by Monenco Limited, 22 Sept 1986; and export clay quantities M.M.Dillon Ltd.,28 May 1987.

(4) Based on cost update by Pilorusso Research, 11 Sept 1987

TABLE E.6
OWMC PHASE 4B - TRANSPORTATION
SUMMARY OF TRANSPORTATION COST CONSIDERATIONS APPLIED TO PHASE 4B

Consideration	Status of Phase 4A Assumptions	Rationale for Status
° Special Waste Quantities	modified	- Site Assessment based on both 150 000 t/a and 300 000 t/a expected to be at the facility in 1995 and 2000, respectively
° Special Waste Cost Basis and Terminal Times	updated	- $1.45/kilometer, when distance greater than 225 km - $80/hour, when distance is less - terminal times included in the distance charge, but additive to trips costed on a time basis
° Treatment Processes	modified	- two possible operating scenarios: typical, and high solidified - type of operation affects number of additional additive/reagent, and clay/ granular trucks - majority of the time the site will operate under the typical conditions, others will be short term only
° Other Materials Transported	new	- Analysis includes the transport of clay materials off-site and import of granular - costing based on 13% increase since 1984 (as per Pilorusso 11 September 1987)
° Site Entrance	modified	- this analysis assumes the site truck entrance to be located 900 metres south of Highway 20 on Schram Road - this modification adds 1 km and 1 minute to every trip

TABLE E.7
OWMC PHASE 4B - TRANSPORTATION
THE RETURN GATE-TO-GATE PLUS TERMINAL TIME
TRANSPORT COST (1987 DOLLARS)

150 000 t/a Special Waste - Typical Operation

Special Waste[1]	$2 184 000
Additives & Reagents	1 130 000
Granular & Clay	905 000
TOTAL	$4 219 000

150 000 t/a Special Waste - High Solidified and Waste Case

Special Waste[1]	$2 184 000
Additives & Reagents	1 409 000
Granular & Clay	1 500 000
TOTAL	$5 093 000

300 000 t/a Special Waste - Typical Operation

Special Waste	$4 368 000
Additive & Reagents	$1 249 000
Granular & Clay	$1 787 000
	$8 404 000

300 000 t/a Special Waste - High Solidified Waste Case

Special Waste	$4 368 000
Additive & Reagents	$2 821 000
Granular & Clay	$2 999 000
	$10 188 000

Notes:

1. Transport cost for 150 000 t/a is one-half of costs displayed on Table E.1

APPENDIX F

COMPARISON OF TRAFFIC CHARACTERISTICS ON ACCESS ROAD 1986 AND 1987

1. INTRODUCTION

As part of the site assessment program, M.M. Dillon Limited carried out a traffic survey along the access road to determine the proportion of heavy and medium sized trucks in the traffic stream. This information was used by the noise consultant in the calibration of the noise model.

The initial surveys were conducted over two 10-hour days in May 1986. Follow up surveys were conducted on one day in May 1987 to provide a comparison to prior data and to gather information on the frequency of movement of dangerous goods vehicles along the access route.

This appendix presents a comparison of the data from the two surveys and conclusions regarding the changes which have taken place over the two periods.

2. RESULTS

Table F-1 presents a comparison of the data obtained during each year of surveys. Generally the data comparison indicates an 11 to 12% growth (May 1986 - 1987) in traffic on Niagara Regional Road 24, while the Highway 20 traffic remains unchanged. In addition, the percent trucks in the traffic stream has increased by 2.7 percentage points in Vineland, remained constant on Niagara Regional Road 24 near Highway 20, and decreased by 2.5 percentage points for Highway 20.

The number of trucks on Regional Road 24 has increased compared to the same 10-hour period in 1986. An additional 223 trucks were counted in the ten-hour period near Vineland or about 22 medium and heavy trucks per hour on average. 75% of these trucks were classified as heavy trucks with 6 or more tires or 3 or more axles. Near Highway 20 on Niagara Regional Road 24 an additional 71 trucks were counted over 10 hours or an increase of 7 per hour. 70% of these trucks were heavy trucks.

The number of trucks on Highway 20 has decreased from the 1986 survey. There were 45 fewer trucks over the 10-hour period or about 5 less per hour. 40% of these were heavy trucks.

The 1987 survey included counting the number of trucks identified as carrying dangerous goods (identified by placards) along the access road. On Regional Road 24 near Vineland there were 31 vehicles carrying dangerous goods over the 10-hour period representing 2.7% of the total truck traffic. Near Highway 20 there were 28 vehicles carrying dangerous goods or 4.0% of the total truck traffic. On Highway 20 there were 10 dangerous goods vehicles representing 4.0% of the total trucks.

TABLE F-1

OWMC PHASE 4B - TRANSPORTATION

COMPARISON OF ACCESS ROAD TRAFFIC CHARACTERISTICS 1986 AND 1987

Intersection Location	Survey Year	Pass. Vehicles	Med. and Heavy Trucks	Total	% Trucks	Dangerous Goods Vehicles # in 10 Hours	Dangerous Goods Vehicles % of Trucks
Niagara Regional Road 24/	1986:	3 167	914	4 081	22.4	NA	NA
81	1987:	3 398	1 137[1]	4 535	25.1	31	2.7
o South Leg	Difference:	+ 231	+ 223	+ 454	+2.7	-	-
	% Change:	+ 7.3	+24.4	+11.1	-	-	-
Niagara Regional Road 24/	1986:	2 195	616	2 811	21.9	NA	NA
Highway 20	1987:	2 459	687[2]	3 147	21.8	28	4.0
o North leg	Difference:	+ 264	+ 71	+ 336	-0.1	-	-
	% Change	+12.0	+11.5	+12.0	-	-	-
Niagara Regional Road 24/	1986:	1 535	303	1 838	16.5	NA	NA
Highway 20	1987:	1 579	258[3]	1 837	14.0	10	4.0
o West Leg	Difference:	+ 44	- 45	-1	-2.5	-	-
	% Change	+ 2.9	-14.9	-0.1	-	-	-

Notes:

1. 75% with 6 or more tires and 3 or more axles
2. 70% with 6 or more tires and 3 or more axles
3. 40% with 6 or more tires and 3 or more axles

3. CONCLUSIONS

The following conclusions have been made regarding the effect of these new data on the Phase 4B transportation impact assessment.

a) The one year traffic growth on Niagara Regional Road 24 is higher than expected; however, the change in percent trucks on the road will not significantly affect the results of the impact analysis which was based on the May 1986 classification data results.

b) Traffic growth on Highway 20 is low, with minor changes in the number of trucks; this will not have a significant impact on the findings using May 1986 data.

c) Under the present conditions there are approximately 3 vehicles per hour carrying dangerous goods on Niagara Regional Road 24. The OWMC facility under 150 000 t/a scenario would add another 3 to 4 dangerous goods vehicles per hour.

APPENDIX G

ANNUAL NUMBER OF TRUCKS FOR EACH YEAR OF SITE OPERATIONS

Annual trucks with continuous excavation of landfill:

- Typical Operations
- High Solidified Waste Case

ANNUAL TRUCKS WITH CONTINUOUS EXCAVATION

NOTE: Tables G.1 and G.2 were used in the production of Figures 4.13 and 4.14 in Chapter 4.

TABLE G.1
OWMC PHASE 4B-TRANSPORTATION

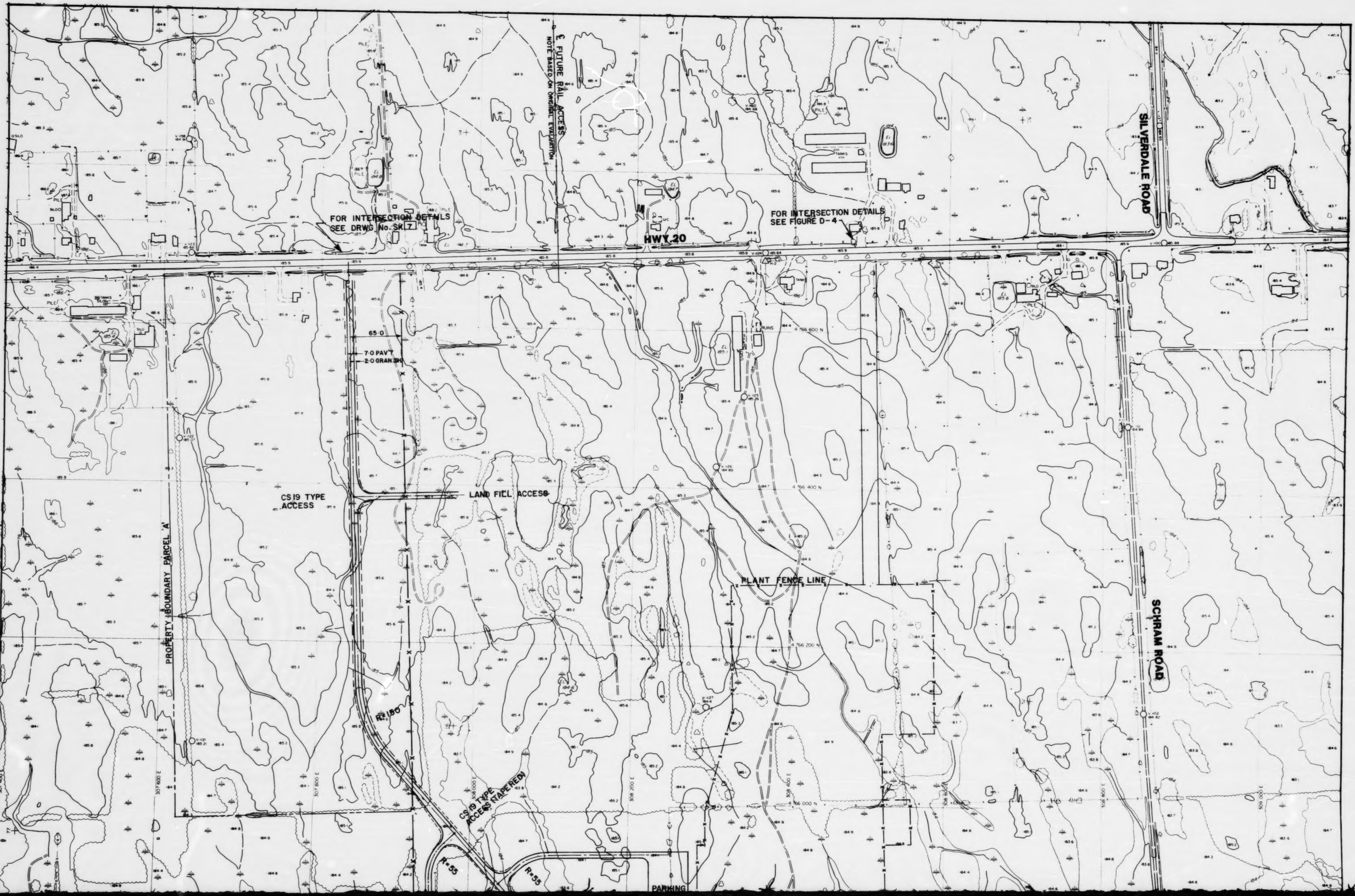
ANNUAL NUMBER OF TRUCKS EACH YEAR OF OPERATIONS
WITH CONTINUOUS EXCAVATION : TYPICAL CASE

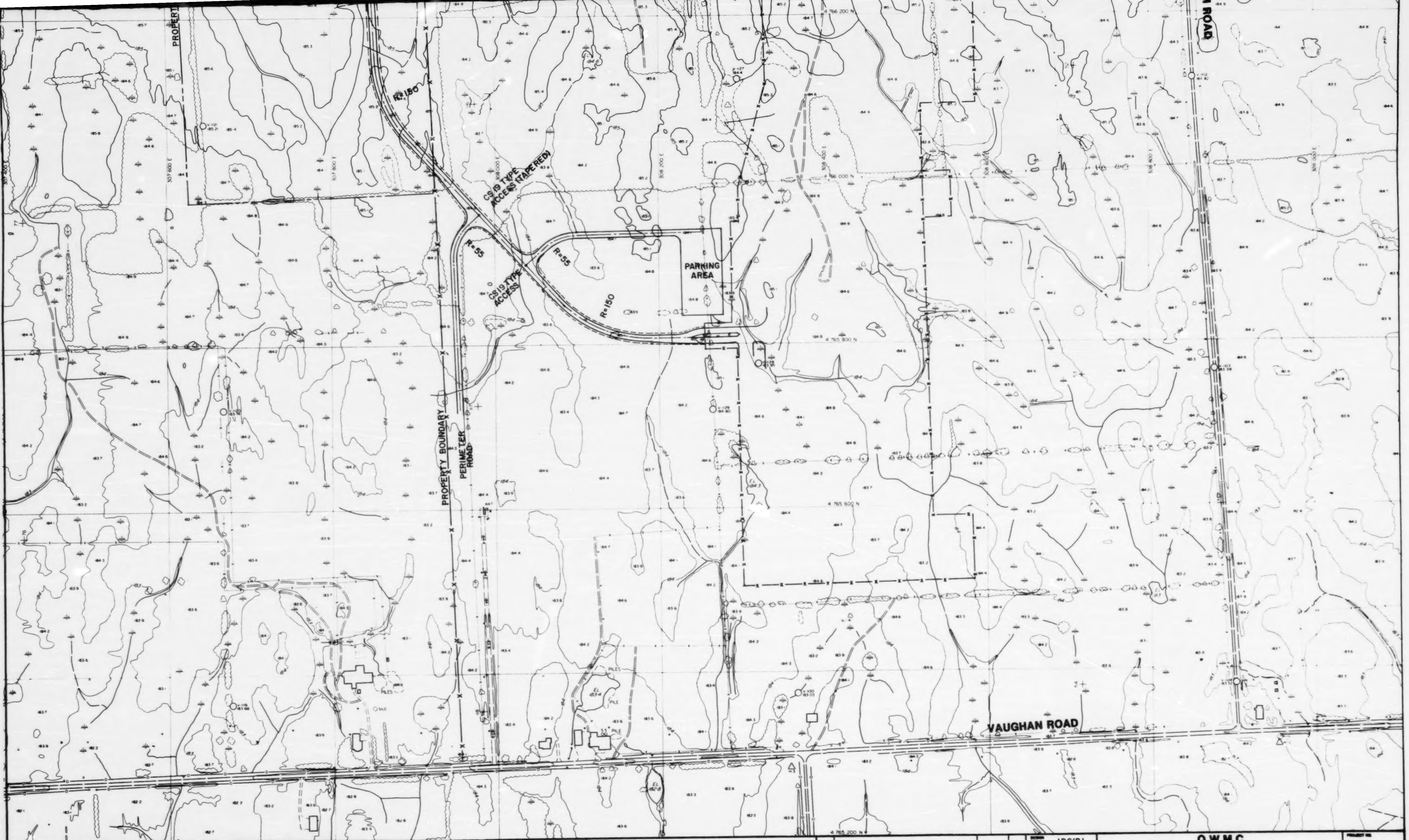
YEAR	SPECIAL WASTES	ADDITIVES REAGENTS	GRANULAR		CLAY		TOTAL TRUCKS
			t/a	trucks	c.m./a	trucks	
1	3260	380	2300	77	36288	2592	6309
2	4562	530	3300	110	50904	3636	8838
3	6840	790	4900	163	76356	5454	13247
4	8470	980	6100	203	94500	6750	16403
5	9776	1134	7100	237	109872	7848	18995
6	11730	1350	8400	280	130788	9342	22702
7	13690	1570	9800	327	152716	10908	26495
8	15640	1790	11200	373	174510	12465	30268
9	17600	2020	12600	420	196182	14013	34053
10	19552	2243	13900	463	217098	15507	37765
11	19552	2243	13900	463	217098	15507	37765
12	19552	2243	13900	463	217098	15507	37765
13	19552	2243	13900	463	217098	15507	37765
14	19552	2243	13900	463	217098	15507	37765
15	19552	2243	13900	463	217098	15507	37765
16	19552	2243	13900	463	217098	15507	37765
17	19552	2243	13900	463	217098	15507	37765
18	19552	2243	13900	463	217098	15507	37765
19	19552	2243	13900	463	217098	15507	37765
20	19552	2243	13900	463	217098	15507	37765
21	19552	2243	13900	463	217098	15507	37765
22	19552	2243	13900	463	217098	15507	37765
23	19552	2243	13900	463	199234	14231	36489
24	19552	2243	13900	463	0	0	22258
25	19552	2243	13900	463	0	0	22258
26	19552	2243	13900	463	0	0	22258
27	19552	2243	13900	463	0	0	22258

TABLE G.2
OWMC PHASE 4B-TRANSPORTATION

ANNUAL NUMBER OF TRUCKS EACH YEAR OF OPERATIONS
WITH CONTINUOUS EXCAVATION : HIGH SOLIDIFIED CASE

YEAR	SPECIAL WASTES	ADDITIVES REAGENTS	GRANULAR t/a	GRANULAR trucks	CLAY c.m./a	CLAY trucks	TOTAL TRUCKS
1	3260	550	3800	127	60732	4338	8275
2	4562	770	5500	183	85050	6075	11590
3	6840	1150	8100	270	127512	9108	17368
4	8470	1420	10100	337	158004	11286	21513
5	9776	1647	11700	390	182196	13014	24827
6	11730	1970	13900	463	218736	15624	29787
7	13690	2290	16200	540	255024	18216	34736
8	15640	2610	18500	617	291564	20826	39693
9	17600	2950	20800	693	327978	23427	44670
10	19552	3272	23000	767	364518	26037	49628
11	19552	3272	23000	767	364518	26037	49628
12	19552	3272	23000	767	364518	26037	49628
13	19552	3272	23000	767	364518	26037	49628
14	19552	3272	23000	767	364518	26037	49628
15	19552	3272	23000	767	364518	26037	49628
16	19552	3272	23000	767	30667	2191	25781
17	19552	3272	23000	767	0	0	23591
18	19552	3272	23000	767	0	0	23591


℄ FUTURE RAIL ACCESS
NOTE: BASED ON ORIGINAL EVALUATION
FOR INTERSECTION DETAILS SEE DRWG No. SK 7
HWY 20
FOR INTERSECTION DETAILS SEE FIGURE D-4
SILVERDALE ROAD
65.0
7.0 PAV'T
2.0 GRAN.SH.
CS19 TYPE ACCESS
LAND FILL ACCESS
PROPERTY BOUNDARY PARCEL 'A'
PLANT FENCE LINE
SCHRAM ROAD
R=180
CS19 TYPE ACCESS (TAPERED)
R=55
R=55
PARKING
4 766 600 N
4 766 400 N
4 766 200 N
4 766 000 N
307 400 E
307 600 E
307 800 E
308 000 E
308 200 E
308 400 E
308 600 E
308 800 E
309 000 E


PROPERTY
R=150
CS19 TYPE ACCESS (TAPERED)
R=55
R=55
CS19 TYPE ACCESS
R=150
PARKING AREA
PROPERTY BOUNDARY
PERIMETER ROAD
PILES
PILE
SILO
EL 183.4
EL 182.8
VAUGHAN ROAD
AM ROAD
4 766 200 N
4 766 000 N
4 765 800 N
4 765 600 N
4 765 200 N
307 400 E
307 600 E
307 800 E
308 000 E
308 200 E
308 400 E
308 600 E
308 800 E
309 000 E

APPROVED	COMMISSIONER OF WORKS	CONSULTANT	FIGURE D-8	NO.	REVISIONS	DATE	BY		O.W.M.C	PROJECT NO.
COMMISSIONER OF WORKS			**DILLON**					DESIGN J.R.C/R.L.	FACILITY ENGINEERING LIASON	9924-13
DATE			Consulting Engineers & Planners					DRAWN · RP	LF - 9C WESTERLY SITE ACCESS ROAD	DWG. NO.
								CHECKED		SK 8
								APPROVED		SHEET
								DATE 12-05-87		
								SCALE 1:4000		